INFORMATION TECHNOLOGY POLICY:

FIRST STEPS FOR THE NEW SOUTH AFRICA

A DISSERTATION PRESENTED TO

THE DEPARTMENT OF INFORMATION SYSTEMS

UNIVERSITY OF CAPE TOWN

IN PARTIAL FULFILMENT OF THE

REQUIREMENTS FOR THE

MASTER OF COMMERCE DEGREE

IN

INFORMATION SYSTEMS

by

K A JOHNSTON

30 MARCH 1996

PREFACE

This paper is not confidential. It's purpose is to promote discussion towards consensus on the merits of an Information Technology Policy based on a national framework. The author believes in the value of this subject and aims to disseminate it's contents broadly to aid the process.

I thank the following people. My supervisor, Professor Derek Smith for his guidance: Dr. Jonathan Miller for research material and suggestions; James McGregor my manager, for his support. I would like to thank all the individuals who took the time to respond to the opinion survey; my wife Bronwen Johnston for her support, assistance, understanding, and meticulous proofing, and my daughters Nicolette and Moira Johnston for their encouragement and approval.

I certify that the paper is my own work and all references are accurately reported.

"Although a causal relationship has not been clearly established between such policies (Information Technology Policies) and economic success, a strong circumstantial case can certainly be made" Dedrick J and Kraemer K L

K A Johnston

ABSTRACT

The fundamental question is not whether South Africa should have a National Information Technology Policy to exploit Information Technology (IT), but more fundamentally what kind of government policies and programs for IT make sense. In today's competitive world what kind of policies and programs will be for the betterment of South Africa's economic and social structures? How can the South African government use IT to increase international competitiveness, and at the same time enhance economic and technological progress and create social improvement in the country? These and many other fundamental questions are the basis for this investigation.

The starting point of this research was to compare South African IT to that in other countries; Expert opinion was obtained to identify specific issues, goals and technologies, and to propose ideas for government policies to:

i) increase the country's competitiveness,

ii) enhance its economic and technological progress, and

iii) uplift its people.

The main points emerging from this research are that the South African government needs to formulate a National IT Policy in order to direct the development of IT. Competitiveness, progress and social upliftment are inseparable and must be balanced when positioning such a policy. The policy should be directed from a high level to ensure that its recommendations are followed.

TABLE OF CONTENTS

CHAPTER ONE INTRODUCTION

"In a time of drastic change it is the learners who inherit the future. The learned usually find themselves equipped to live in a world that no longer exists", Eric Hoffer (1902-1983)

1.1 BACKGROUND

A new South Africa was born on the 27 April 1994. For the first time in history South Africa had a democratically elected government. An objective which many people fought and died for, and continue to strive for its survival.

President Nelson Mandela (ANC, 1994, preface) wrote "Democracy will have little content, and indeed, will be short lived if we cannot address our socio-economic problems within an expanding and growing economy". The Reconstruction and Development Programme (RDP), was established to address these issues, and the first priority was meeting the basic human need of jobs (ANC, 1994, p7). Minister Jay Naidoo (1996, p24) wrote "When asked where the government could help them, more than half the poor say that jobs are their top priority."

Therefore it is the view of its leaders that for democracy to survive in South Africa (SA), she has to create jobs; to create jobs, she must expand her economy; to expand the economy, she will have to be competitive in the world market. To be competitive, South Africa will have to develop a programme of action to maximise the benefits of

Information Technology (IT), while simultaneously enhancing economic and technological progress and creating social improvement in the country. "A technologically fluent workforce is a prerequisite for economic growth which underpins job creation and an improved quality of life - our national goals." (S&T Green Paper, 1996, section 9).

Two hundred years ago those parts of the world, that we now call the developing world, failed to join the first industrial revolution. Many are still trying to make up the lost time and only an insignificant few have succeeded. In the mean time, the micro chip has ushered in the second industrial era. We can either despair at trying to overcome the seemingly impossible , or we can endeavour to turn our weaknesses into strengths. In order to achieve this an innovative strategy will be required. This time we can choose between total success or annihilation (Bharali, 1994, pp489-495).

South Africa (SA) finds itself on the convergence of two revolutions. First, a social revolution instigated by the democratic elections in 1994, and second, the information revolution which promises to restructure the way people live and work (Song and Akhtar, 1995, p53). The government must manage all systems (education, health, environment, IT, etc.) to effect social change. Progressive social change can only be attained by managing the whole (Flood,1994, pp 74-78). The opportunity for the government to choose democracy, innovation and dynamism to drive South Africa's economic prosperity into the new millennium is a vital action point.

South Africa desperately needs to improve the quality of life of her people, must strive to produce goods and services that meet the test of world markets, and can no longer rely on cheap labour and abundant natural resources to drive her economic prosperity. South Africa has, in fact failed to deliver in the past, as the vast majority of her people suffer from the ills of poverty, unemployment, poor housing, poor health care, inadequate education, poor environments and escalating violence, brought about through a harsh and vigorous system of apartheid.

IT can help to rouse South Africa by stimulating innovation. It has the capacity to be upgraded as well as the capacity to upgrade the quality of life, and we have the opportunity to harness IT in order to make it the driving force of economic prosperity. The question is; what role should government play in controlling this power? (Johnston & Miller, 1994, p59)

Information and communications infrastructure is seldom regarded as having the same priority as other basic needs. Thabo Mbeki said at the G7 Conference in Feb. 1995 "..the new democratic government has a whole range of pressing problems to attend to. These include such issues as job creation, housing, provision of clean water and adequate sanitation, education and health care. It is , however, also clear that we need a vastly expanded and modern information and communications infrastructure to help us address these concerns, " (Song and Akhtar, 1995, p55)

This research compares the development of IT in South Africa to that in other developing countries, and identifies issues and technologies that could be addressed. Expert opinion as to the needs in terms of IT was gathered. A National IT Policy to control the development of IT in South Africa is recommended by this report, which will contribute to the debate surrounding the role of the South African Government in IT.

"We are part of the information age, and must think and plan accordingly" (S&T Green Paper, 1996, section 3.4)

1.2 DEFINITIONS

1.2.1 Information Technology (IT)

For the purposes of this dissertation, the term "Information Technology" (IT) will be taken to mean all computer and telecommunications equipment (hardware), as well as the programs and applications (software), and the information product. Procedures and people in the IT industry are also included. This wide definition of the term has support in IT literature (Crossman et al, 1995, p13) and (NCLC, 1994, p3).

1.2.2 Information Technology Policy (ITP)

A National Information Technology Policy (ITP) is a programme of action that defines the framework to harness IT for the greatest possible benefit.

Miller (1994a, pp 1-2) outlined the distinction between a national *information technology* policy and a national *information* policy. IT policies stress the skills and facilities required for processing information. Information policies concentrate on the information: what is collected, who should have access rights, and the preservation of the integrity of the data. Miller adds that there is not much evidence of pure information policies, and that IT policies include many elements of a so- called information policy. This dissertation shall not distinguish between the two, and IT Policy will be taken to incorporate both.

IT policy must form part of a broad strategy and be influenced by other national policies and strategies dealing with the economy, research, manpower, training, education and other sectors according to Miller (1994a, p13) and the NCLC (NCLC, 1994, p3).

1.2.3 Competitiveness

The 1985 Report of the US Presidential Commission on Industrial Competitiveness (Vol. II, pp 7-8) (OECD, 1992, p242), suggests that "Competitiveness for a nation is the degree to which it can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously maintaining and expanding the real income of its citizens. Competitiveness is the basis for a nation's standard of living. It is also fundamental to the expansion of employment opportunities and a nation's ability to meet its international obligations". This definition is accepted by OECD (OECD, 1992, p1994) and the 1994 World Competitiveness Report (WCR, 1994, p18).

The World Competitiveness Report (WCR) argues that competitiveness is best measured by eight factors of competitiveness (WCR, 1994, p24):

- Domestic Economic Strength - an overall evaluation of the strength of a country's domestic economy
- Internationalisation - the extent to which a country participates in international trade
- Government - extent to which government policies are conducive to competitiveness
- Finance - performance and quality of financial services
- Infrastructure - extent to which infrastructure serves basic needs of business
- Management - extent to which firms are managed innovatively, profitably and responsibly
- Science and Technology - scientific and technological capability, and success of R&D
- People - availability and qualifications of human resources.

Competitive advantage means having the best there is on offer and making it impossible to find substitutes (Boscheck, 1994, pp135-136).

1.2.4 Developing Countries (DC)

South Africa's per capita income of under US$3 200 classifies it as a developing country (Miller, 1994b, p1). In global terms South Africa is classified as a upper middle class

developing nation behind for example India, the Philippines and Turkey (Miller, 1994b, p1).

Crossman et al (1995, p14) define a developing economy as one in which there is:

- Little export diversification
- Lack of national economic independence
- Increased economic subordination
- Wage differentiation
- Widespread poverty
- Widespread unemployment
- Population demographics (mostly young people)

1.2.5 Reconstruction and Development Programme (RDP)

South Africa is going through a metamorphosis to a democratic society. The programme accepted by the government to drive this process is the Reconstruction and Development Programme (RDP). The RDP defines itself as "an integrated, coherent socio-economic policy framework" for the rebuilding of South Africa. The South African government will develop positions and legislative programmes within this framework (ANC, 1994, p1).

The six basic principles of the RDP are:

- An integrated and sustainable programme
- A people-driven process

- Peace and security for all
- Nation-building
- Link reconstruction and development
- Democratisation of South Africa (ANC, 1994, pp4-7).

1.2.6 Gross Domestic Product (GDP)

Gross Domestic Product (GDP) is defined as the total market value of all final goods and services produced in a country in a specific period. Gross means there has been no provision made for depreciation and double counting is avoided by using final goods and services (Mohr et al, 1995, p36).

GDP is a clue to a country's economic performance, but is not the only indicator. Unwanted by-products like pollution, noise or congestion are not measured. GDP figures do not distinguish between different types of production or expenditure, or account for changes in quality. GDP also makes no allowance for exhaustion of scarce mineral sources (Mohr et al, 1995, p39).

1.3 RESEARCH QUESTIONS

The main research question is the role that the South African government should play, if any, in exploiting IT for the betterment of its economic and social structures.

How can the South African government use IT to increase international competitiveness, while simultaneously enhancing the country's economic and technological progress, and improving social conditions? What kind of government policies and programmes for IT make sense for South Africa in the new competitive world, and what kind of policies and programmes will uplift South Africa's economic and social structures?

Is IT an industry in which South Africa can achieve competitive advantage (or create competitive advantage in other economic sectors) and, if so, what are the associated costs and benefits.

An International Development Research Centre (IDRC) report (Mullin et al, 1992, p9) states that many countries are wrestling with three broad sets of policy objectives;

- Promoting international competitiveness for their enterprises
- Social equity for all citizens
- Sustainability of their interactions with a natural environment.

There is according to Mullen et al, a growing consensus that these three goals are inseparable.

1.4 BENEFITS OF RESEARCH

Coates (1995, p249) says most people in positions of authority do not completely understand the range of alternatives before them when dealing with a particularly complex situation. They often don't realise whether they have a problem or potential

opportunity. As a result they usually see an unnecessarily restricted range of choices available, and no means of insight into the possible outcomes of the choices.

Perhaps there is no more important strategic policy issue facing South Africa than the development of a national information infrastructure and the preparation to contribute to the African and global information societies (Moikangoa et al, 1995, p1).

This research will fuel the debate surrounding the role of the South African government in IT, and will highlight which policies have been successful in other developing countries, why they were successful, and how they could be relevant to South Africa.

1.5 OBJECTIVES

South Africa does not have an ITP at present. With this in mind, this dissertation has four main objectives.

- The first objective is to compare South Africa's IT endowment with that of other developing countries, to identify specific issues, goals and technologies, as well as gaps between South Africa and the other countries. This will provide the reader with a broad background of information on ITPs.

- The second objective is to gather local and international opinions regarding what should form part of an IT policy for South Africa.

- The third objective is to recommend a South African Information Technology Policy which would increase South Africa's international competitiveness, enhance our economic and technological progress, and improve our social structures.

- To stimulate discussion on the role the South African government could or should play in respect to IT Policies.

"Once a country has formulated a policy, its most important objective has already been met; i.e., formulating a process of thinking about the informatics challenge at the national level" (Perez, 1992, p9).

1.6 SCOPE AND LIMITATIONS

This research will focus on national issues, rather than provincial or local IT issues. This focus similarly does not encompass a full audit of IT in S, or issues of cost, timing, resources and implementation of a national IT policy.

This is a complex arena, largely at an abstract level, so there is little definitive information available. The research will be exploratory qualitative research, rather than quantitative research. Hypotheses will be "tested" by opinion rather than fact.

Comparing and interpreting economic data from different countries is complex, as definitions may differ between countries; Time and currency fluctuations and a host of

other factors add to the complexity. Much of the data arises as a by-product of some administrative processes, in which case the definitions are usually determined by the administrative practices and procedures, rather than statistical or economic considerations.

The level of official data on South Africa is poor and a great deal of data on South Africa is of a "best estimate" variety. Data is generally very scattered and generally inadequate.

1.7 HYPOTHESES

Hypotheses must be able to be tested or proved, and as stated quantitative means are not the direction of this research. The hypotheses will thus be tested or proved by inference, by asking experts to give their opinions.

Hypothesis 0: An IT Policy is irrelevant and therefore not required.

Hypothesis 1: If the South African government does not implement an ITP, each province will go its own way resulting in duplication, redundancy, incompatibility etc.

Hypothesis 2: If South Africa adopts certain policies (e.g. removal of certain controls, deregulation of certain industries, free trade agreements, certain tax reductions, tax incentives) she would increase her competitiveness by increasing the potential to produce IT (software and services in particular) for sale to Africa, and the world.

Hypothesis 3: To have a successful IT Policy, a government must balance IT against other policy options.

1.8 METHODOLOGY

This is a Comparative Study. Most of the work is desk work. Literature and data on IT from South Africa and several developing countries was collected. The IT status of these countries was compared to gain fresh insight, to understand alternatives, and to produce a recommended IT policy for South Africa.

A questionnaire was developed and individuals (opinion makers) were selected to verify the recommended policy. The questionnaire was sent to all South African government departments, as well as to industry associations, universities, research centres and professional societies.

A recommended IT policy was then developed using the comparative study, and the opinion survey.

1.9 STRUCTURE OF THE REPORT

The report is divided into eight chapters, six of which are content chapters. Chapter one is the introduction. Chapter Two is a literature search of IT policies, competitiveness and previous research on ITPs in South Africa. Chapter Three describes the research approach adopted. The research findings which compare South Africa's IT to other countries, and the results of the opinion survey are in Chapter Four. A recommended national IT policy is constructed in Chapter Five. Summary and Conclusions are drawn in Chapter Six.

Chapter Seven is the Bibliography, and Eight a glossary of terms and acronyms used.

CHAPTER TWO THE LITERATURE SEARCH

"Fools make researchers and wise men exploit them" H G Wells (1866-1946)

2.1 INTRODUCTION

The objective of the literature search was to review national IT Policies (ITP) and competitiveness. This began with the historical development of IT policies, how they develop within a country, what options and instruments are available to governments, and the effects or perceived effects of the policies. A number of countries' ITPs were reviewed, their successes, failures and problems were looked at. Previous and current research on ITPs in South Africa was examined. Models that compare IT between countries were also examined. The majority of the literature referenced was published after 1991.

2.2 HISTORY AND STATUS OF IT POLICIES

"No country, including the United States, has developed a successful IT industry without significant government involvement." (Dedrick and Kraemer, 1993, p354).

This section will review the history of ITPs to date. It will look at directions a country can take in terms of ITPs, and the phases through which countries progress on their way to ITPs. Current ITP trends, issues and instruments will then be listed.

Den Hertog and Fahrenkrog (1993, p1) state that IT Policies were first formulated in the late 1960's. Initially the policies emphasised creating and improving the capacity to generate new IT expertise and systems. Extensive national IT R&D programmes were established in the late 70's and early 80's. In the second half of the 80's ITPs aimed more at dissemination, application and exploitation of IT expertise and the construction of IT infrastructures.

Governments have to decide what direction they would take regarding IT. Okot-Uma (Odedra, 1993, p10) classified ITP initiatives into three generic categories:

- Non-existent, where governments do not concern themselves with developing vehicles for introducing and enhancing IT. This is an uncommon situation in the 1990's.
- Implicit, where governments actively participate in IT, but work with informal co-ordination mechanisms and strategies. Implicit policy measures include import duties and tariffs. Many governments (e.g. Brazil) adopted a negative role by imposing restrictive rules and regulations on telecommunications and IT trade (Miller, 1994, p1). Implicit ITPs are found in Australia and New Zealand.
- Explicit, where governments actively drive IT by formulating ITPs, and designing strategies for implementing IT and ensuring it is assimilated into the country. Explicit policies can include IT utilisation and application related policies. These policies are usually implemented by a national agency or ministry with special responsibility for IT related matters. Explicit ITPs exist in countries such as Singapore and India.

At present, almost every country is trying to develop and implement an ITP, either explicitly or implicitly according to Perez (1992, p8).

Okot-Uma (Odedra, 1993, p13) postulated that the development and implementation of an ITP comprises three consecutive phases;

- The initial-conceptual phase, in which the government is not actively involved with IT. This phase is characterised by the absence of an ITP framework or strategy. South Africa is currently in this phase. This initial phase may naturally develop into the second phase.
- The policy dynamics phase, in which a country either implicitly or explicitly strives to prepare itself for IT acquisition, production, use or diffusion. An ITP may be formulated in this phase.
- The maturation phase, where state control over IT acquisition and use is gradually relaxed, and there is a slow transition from centralised control to centralised influence and decentralised control (Odedra, 1993,13)

The current trend in developing ITPs according to Den Hertog and Fahrenkrog (1993, p1), Miller (1994, p1) and the OECD (1992, p15) is towards integrating the ITP with other national policies such as industrial, economic, R&D, manpower, science and technology, promotion of small business, health and education policies.

As Perez (1992, p8) says, technological (of which IT is a subset), economic and social change are interdependent. ITP is not an event, and should not be viewed in static but in

dynamic terms. An ITP must be flexible in order to remain open to new scientific and technological developments.

"A national IT strategy is not the product of a central organisation or a single level of decision making. It is not a single event or a blueprint plan. It does not emerge full blown nor is it government driven. Rather, it is the result of a mix of deliberate and strategic decisions, central guidance and local initiative, and private sector-government collaboration." (Hanna and Dugonjic, 1995, p39).

Harfoush and Wild (1994, p11) add that an ITP must fit within the overall policy framework defined by the government. For any policy to be accepted by the current South African government, the policy will have to be consistent with the RDP, since this is the government's blue-print for the future.

Today's ITP may address a variety of issues. Miller (1994, p2) and Odedra (Odedra, 1993, p27) list several IT policy options available to governments;

- Policies to support specific economic sectors
- Initiatives in other national policies (education, industrial, economic and science)
- IT education and training programs
- IT procurement mechanisms
- R & D or specific innovation policies
- IT design and manufacture
- Adoption policies aimed at small to medium-sized businesses
- Effective technology transfer policies

- Prioritised government IT applications
- Management support policies.

ITP instruments available to governments according to Miller (1994, p2), Dedrick and Kraemer (1995, p49) and Montviloff (1995, p442) include;

- Financial (subsidies, loans and grants, tax reductions, investment incentives or restrictions, import duties, government procurement, tariffs)
- Information and awareness instruments (technology transfer, demonstration programs, management support, focus on using IT, information programmes, information management, information communication and information economics)
- Regulatory instruments (liberalisation in telecommunications, competition policy, import restrictions, export promotion, intellectual property rights regulation, legal access to information, patents, constitution, acts, laws, regulations, international agreements)
- Support instruments (state owned enterprises, infrastructure such as education, R&D, telecommunications, power)
- Professional instruments (codes of conduct, professional ethics)
- Cultural instruments (customs, beliefs, traditions, social values).

The wide variety of ITP options and instruments which can be combined in many ways, plus a country's unique social and economic situation, ensure that each country will produce its own distinct set of instruments to create an individual ITP. Perez (1992, p8)

says that producing an ITP means wanting to have a role for the country and its inhabitants and being able to define and build a desired future.

Today all industries in all countries are in global competition. Some developed and developing countries are well endowed with IT, their ITPs are designed to allow them to exploit and grow their advanced base of IT to reduce costs, improve quality and productivity, and thus improve their competitiveness (Miller, 1994, p6). The less developed countries need to increase their competitiveness or remain permanently dependant on the developed countries. One way to enhance their competitiveness is to exploit IT more effectively.

The purpose of national IT policies is thus clear. Governments of both developed nations and developing nations wish to use IT to improve their global competitiveness by improving their scientific and technological capacity, and infrastructure, thereby shaping the behaviour of industries and people. Improving the competitiveness of a country, will invariably improve the quality of life and standard of living of the individuals living in the country, and enhance the government's chances of remaining in power.

2.3 BENEFITS OF IMPLEMENTING ITP

"*Although a causal relationship has not been clearly established between such policies and economic success, a strong circumstantial case can certainly be made*" (Dedrick and Kraemer, 1993, p334).

Al Gore and Newt Gingrich agree on one thing - that the information superhighway heads the list of technologies that are of crucial consequence to the country's social and economic future. Gingrich sees the information revolution as one of history's most powerful instruments of social change (Lepowski, 1995, pp72-76).

2.3.1 Economic

Braa and Power (1995, p134) state that the distribution and exploitation of IT is closely linked to economic development.

An improved IT infrastructure and increased IT use can benefit the economy as a whole by improving economic productivity according to Kraemer and Dedrick (1995, p72) and Dr Skweyiya (1994 , p66).

IT is considered a high-growth industry with the potential to create jobs and stimulate economic growth. It is also considered an economic driver because technology developed for it is applied to other industries and because a growing IT industry can drive growth in supporting industries (Dedrick and Kraemer, 1995, p30).

Dr R Adam (1995) Chief Director in the Department Art Science Culture and Technology stated that the current South African Government believes that well planned Science and Technology (with IT as one of the main technologies) can assist in increasing the competitiveness of South Africa's economy by developing and fully utilising her human resources potential, and thus improving the quality of life.

Economic development specialists are starting to recognise that investments in IT play a critical role in stimulating economic growth and productivity. The rapid growth of the East Asian newly industrialised economies is at least partially attributable to their investment and planning of IT (Kraemer and Dedrick, 1994a, p1921). Major economic and social benefits arise from the application of IT by other economic sectors and the public sector (Dedrick and Kraemer, 1995, p56).

The influence of IT on the economies of developing countries is so positive that governments cannot afford to ignore its value (Crossman et al, 1995, p13). In order for a country to reap the benefits of IT, a government needs to plan its use and diffusion.

2.3.2 Enabler

IT is the greatest enabler man has seen: It holds the power to eradicate privilege, break down barriers and uplift all South Africa's people (Heydenrych, 1994, pp 5-6). Blake (1995, p1) states that IT is the key enabling technology of our age, as it amplifies limited resources, spreads information and expertise widely, and makes industry more

competitive. On the Internet, Blake (1996) stated that properly planned IT enables local (community, municipal) groups to tackle their problems as they see fit.

IT enables businesses and governments to model reality and simulate processes, which allows for the safe testing of proposed designs, their improvement and refinement. These simulations speed up the implementation of new developments (Hookes and Brick, 1993).

The benefit of an ITP is that it would enable South Africa's people to harness IT.

2.3.3 Strategic

IT offers strategic benefits to a country, and many Developing Countries (DCs) have targeted IT for special policy and infrastructural support because it is one of the largest, fastest growing and most profitable industries today. Munasinghe (1995, p476) and Hanna and Dugonjic (1995, p32) agree that IT is an essential strategic infrastructure which benefits countries by enabling companies, institutions and economic agents to share knowledge, and collect, process and transmit information quickly and at decreasing cost.

An ITP should target the software and services sectors, as they have been the fastest growing segments of the IT industry world-wide. The IT services sector grew at a rate of 31.5% p.a. world wide from 1986 to 1991, while the software sector grew at 13.5%

p.a., and the hardware growth was 6%. Software and services are also labour intensive and so create more jobs (Dedrick and Kraemer, 1995, p55).

An ITP is more likely to be successful if it takes advantage of a country's strengths, and shores up its weak areas (Dedrick and Kraemer, 1995, p53). ITPs are most effective when co-ordinated around strategic goals by a strong governmental agency to achieve a clear set of objectives (Dedrick and Kraemer, 1995, p56).

Hanna and Dugonjic (1995, p32) and (Braa et al, 1995, p21) contend that a national strategy is required to exploit and benefit from IT.

2.3.4 Government

An ITP is needed so that the structure and procedures of government become transparent to the public. Instead of the old perception of government being comprised of many separate, unrelated entities operating in different buildings and within office hours, putting a government "on-line" would result in the government becoming more accessible and responsive to it's people. The benefits to the citizens will be improved service quality and improved interaction with the government from any part of the country (G7 Pilot Projects, 1995).

According to Song and Akhtar (1995, p63) IT Policy will mean the difference between a well-informed government empowered to make informed and enlightened decisions, and

a government that misuses its limited resources because it cannot find or effectively use the information that it requires.

An ITP will benefit citizens if the government plans the information needs of the country to ensure that local information resources are mobilised and shared, and allows global knowledge to be tapped. A well planned ITP will assist in extending basic services to vast populations, as well as informing citizens of public policy and promoting transparency. It can also contribute towards promoting national consensus, broad participation and social learning according to Hanna and Dugonjic (1995, p36) and Heymans (1995, p61).

Evidence gathered by Ein-dor et al (1994, pp35-37) suggests that there is a link between government policies which support IT and local IT production. Their findings suggest that government support for IT (as in Singapore) is a lot better than no support at all (as in New Zealand), but that the most favourable level of government support is somewhere in between.

The only realistic way to consolidate all the government and provincial information is by developing an ITP. An ITP can then facilitate the sharing of the consolidated information between government departments, between government and business, and between private citizens and government. It can further benefit government by providing them with better decision making tools and data.

2.3.5 Globalising

IT is a universal technology according to Hookes and Brick (1993), and properly planned, it can connect and integrate separate parts of the production processes. It can make the complexities of the production process explicit, because it allows almost immediate feedback between needs and supply. IT can facilitate communications and control.

A successful ITP should have an international focus, and will take the strategic concerns of Multi-National Corporations (MNCs) into account, as they dominate the industry and control the most vital IT. Foreign investment incentives, such as low tax, and low regulation environments attract MNCs, who then benefit the host country by providing jobs, technology transfer and access to international markets (Dedrick and Kraemer, 1995, pp52-54).

IT facilitates DC's participation in global trade and production. The rising information content of the global economy, the increased pace of economic transactions and demand for rapid response are almost impossible to accomplish without IT. For DCs to be successful in the new global economy and benefit by moving up the development ladder, they will need to develop a strategy for the IT industry because of the industry's strategic importance and its specific infrastructural requirements (Hanna and Dugonjic, 1995, p36-37).

2.3.6 Human Resources

Paul Strassman, quoted by Thahane and Amin (1994, p205), holds the opinion that "Nothing in human history has been as successful as information technology. There is no precedent whatsoever in the history of man's quest to acquire tools that compares in speed and power and endowment of human beings with unprecedented capabilities as what information technology has delivered".

Dedrick and Kraemer (1995, p55) and Blake (1996) agree that software development is one of the few remaining labour intensive activities which creates jobs, whilst having a sustainable future.

Strong correlation's exist between the number of scientists and engineers and success in IT production. An ITP must support university education in computer science and other professional skills in order to develop the human resources required to develop an IT industry (Dedrick and Kraemer, 1995, p54).

Thahane & Amin (1994, pp 205-212) say that it is imperative for governments to stop the flight (brain drain) of citizens looking for more attractive opportunities elsewhere. If the country's economy is not linked to the global economy, market share will decrease, and the country will be unable to remain competitive. Isolation is guaranteed to put the top people in a country to flight, and an ITP, as defined must address all the needs and constraints related to IT.

The Green Paper (S&T Green Paper, 1996, section 10.2) says that an established IT and communications infrastructure can play a major role in public education. The diffusion of information through satellites should be fully exploited to educate the people of South Africa.

The major benefits of having an ITP are thus the positive spin offs of educational development and job creation.

2.3.7 Competitiveness

Blake (1996) believes that planned IT implementation could enhance the competitiveness of industry by protecting jobs, and distributing scarce resources of human expertise and connecting remote areas. Commerce, industry, democracy, health, education, and the environment could all benefit from the appropriate stimulation of innovation and development.

2.3.8 Productivity

IT is a key generic technology, with applications covering all industries and services. It's rewards are often dramatic and result from the organisational changes that it brings (Hanna and Dugonjic, 1995, p32). Hanna and Dugonjic (1995, p32) and Munasinghe (1995, p476) agree that IT makes it possible to process information rapidly and inexpensively, thereby increasing productivity and improving quality and efficiency in all types of industries and services.

Munasinghe (1995, p476) adds that IT has potential for employment generation, and has good growth potential. IT automates processes, allows fast information storage and retrieval, as well as very fast communication capabilities. It offers improved productivity and quality, computer-aided design and manufacturing applications.

Kraemer and Dedrick (1994a, pp1926-8) present compelling evidence of a strong relationship between investment in IT and growth in productivity and GDP. They show that GDP and productivity growth are highly correlated with growth in IT investment. They cite Thailand, Korea, India and Taiwan as having shown fast growth in IT investment, ranked among the leaders in productivity growth. These findings challenge the notion that IT investment and use does not pay off in productivity improvements. With the proper planning and policies IT has the potential to offer many productivity benefits to DCs.

2.3.9 Democracy

One of the main aims of South Africa's democratisation is to change from a centralised authoritarian rule to a more decentralised and democratic style of governance according to the Green Paper on Science and Technology (S&T Green Paper, 1996, section 10.2). The Green paper states that if people are to participate meaningfully in a truly democratic state, their access to information and their ability to appraise and react to that information is crucial. Both can be greatly enhanced by IT and a suitable communication infrastructure.

IT can be used for either authoritarian or democratic purposes. The choice is made by politicians, governments and IT professionals and the plans they put in place. IT can benefit society if used for democratic ends. Democracy reflects the renaissance conception of mankind, whereby each individual should have the opportunity to access and interpret the ideas of others, as well as having scope for self determination and self fulfilment. Modern IT has been readily applied in the service of democracy. IT made a significant contribution to the breakdown of the Soviet Union by PCs delivering "samizdat", the means for cheap reproduction of dissident newsletters. The Internet is essentially flat, the software is highly distributed, the redundancies very high, and its robustness, its resilience and its capacity to resist authoritarian governments are therefore all of a very high order (Clarke R, 1994, pp591-594).

2.3.10 Telecommunications

Kenney (1995, p37) says it has not been possible to demonstrate conclusively that a telecommunications infrastructure has a positive effect on the socio-economic development of a country by relating telecommunications development to GNP. There is a correlation between the two, but it is difficult to prove which is the cause and which is the effect.

Investment in telecommunications is important in promoting IT use. IT use, in turn, could indirectly benefit the telecommunications industry by increasing local demand (Dedrick and Kraemer, 1995, p53).

2.3.11 R&D

Part of an ITP should be devoted to R&D, to providing incentives and support for local R&D. An ITP would promote local R&D which is needed to find areas where IT can benefit South Africa's communities. Local R&D can examine ways of using IT for remote rural areas, deprived communities, uncompetitive industries, and over-stretched services (Blake, 1995a, p2).

Unless nourished by continuous contact with international research and science networks, R&D may stagnate, according to Talero (1994, p18), and an ITP would ensure international R&D collaboration was promoted.

2.3.12 Listed Benefits

The following three individuals list very different benefits from an ITP.

Blake (1996) lists the benefits of developing an ITP as:

- Knowledge and expertise can be widely disseminated
- Enhanced competitiveness of industry and commerce
- Geographic isolation from other developing countries, world markets, and expertise can be overcome
- Greater global market transparency.

Talero (1994, p22), a Principal Informatics specialist, at The World Bank lists four benefits of such a policy:

2.4 DRAWBACKS OF IMPLEMENTING ITP

"It is very easy to kill the goose with the potential golden eggs with badly thought out policies" (Blake, 1995, p1)

2.4.1 Bad Policy

Governments and bureaucrats are generally bad IT policy makers. Japan is an example of the dangers of overly explicit ITP formulation, Blake (1995, p4). Competitiveness and success cannot be legislated into existence, but environments can be created which either encourage growth or stagnation (Blake, 1995, p1). Bad IT policies could be more detrimental to a country than having no policy at all.

Brauer (1994, pp513-514) says it is just as important to remember what can be done without IT as it is to remind ourselves of what may be lost when we do use IT.

2.4.2 Central Policy

Central government policy making has ideological baggage, as the concept is associated with a Soviet-style political and economic system, and has more recently been criticised as an effort to "pick winners and losers", rather than letting market forces function (Dedrick and Kraemer, 1995, p33). There is also a fear that with a single policy, impact of one issue can start the domino effect of unrelated impact.

IT can be seen as a tool of centralised power, of authoritarianism, and of control warns R.Clarke (1994, p591), and an ITP may therefore be seen as a method for a government to exercise central control.

2.4.3 Lack of understanding

The South African government doesn't understand IT according to Blake (1995, p1), while Mullin et al (1992, p22) add that there is a vacuum in leadership on issues dealing with IT at ministerial level, and that there are no articulated goals and objectives. This does not auger well for developing an ITP, because if government does not understand a concept, it is unlikely to develop a good plan.

There is a lack of clear best practises for ITPs. ITPs vary greatly in the type of instruments they use, the options they choose, the degree of policy integration, the level of government intervention, and in the balance between demand and supply promotion (Talero, 1994, p19).

The problem of poor maintenance of IT leads to a drop in profit and to eventual capital loss. Woherem (1995, p7 & p12) argues that a maintenance policy should be developed, and maintenance staff should be adequately motivated and rewarded.

2.4.4 Other Policy constraints

IT is not the most important problem facing any particular country at present. However, it may well be the fastest changing component of a country's economy. Lacking the

immediacy, if not the importance, of concerns in critical sectors (such as agriculture, health, industry or trade), ITPs tend to be dominated and constrained by policies in other sectors. Thus, ITP is handicapped from the beginning by having to cope with given policy constraints in more mature areas (Munasinghe, 1995, p477).

IT has enabled the trend of internationalisation or globalization. This trend is based on the domination of western culture, and serves the interests of MNCs. DCs must address their own needs and develop their own order of information and ITPs to preserve their cultures (Avgerou and Madon, 1995, p10).

2.4.5 Economic

Dedrick and Kraemer (1995, p52) suggest that any investment incentives to MNCs cost the government revenue in lost taxes or subsidies paid out, and may harm local companies who don't receive the incentives and have to compete with MNCs.

Countries which have protected and subsidised local IT production (for example Brazil, India) have incurred costs which have been borne mainly by users, taxpayers, and foreign producers (Dedrick and Kraemer, 1993, p336).

In countries where there is a shortage of funds, it often makes more sense to fully utilise what they have, effectively and carefully, rather than purchase new IT (Woherem, 1995, p13).

IT might have a negative effect on economic growth if it leads to, or is linked with, elimination of jobs through business processes re-engineering (Kraemer and Dedrick, 1994a, p1924).

IT can threaten and change what used to be perceived as relatively secure clerical jobs. This creates a concern for the trade unions (Cyranek, 1994, p471). IT eliminates the types of jobs to which trade union members aspire. IT displaces unskilled workers and creates a demand for higher or different skills (Crossman et al, 1995, p16).

There is no clear evidence linking IT expenditure to the existence of a formal ITP. Higher growth rates were found among the developed countries and one newly industrialised country without ITPs says Kraemer et al (1992, p152). They add that insufficient evidence was found to conclude a correlation between ITPs and IT diffusion. This does not indicate that policy does not matter, but it may indicate that what matters most is the range of policy decisions that affect the cost of labour versus the cost of IT.

2.5 COMPETITIVENESS

"World competitiveness is the ability of a country or a company to, proportionally, generate more wealth than its competitors in world markets". (WCR, 1994, p18)

2.5.1 Definition

Many governments have embarked upon competitiveness crusades. The World Competitiveness Report (WCR) defines a competitive society as one which has found a dynamic equilibrium between wealth creation on one side, and social cohesion on the other (WCR, 1995, p6). A competitive society identifies and manages all aspects of its competition, from infrastructure to education. It strives to achieve a balance between proximity and globality.

The concept of competitiveness is elusive, there is no single widely accepted definition of competitiveness. For the purposes of this report the following definition (as listed in section 1.2.3) will be used. The OECD (OECD, 1992, p237) definition of competitiveness is "the degree to which a country can, under free and fair market conditions, produce goods and services which meet the test of international markets, while simultaneously maintaining and expanding the real incomes of it's people over the long term". De Woot (1990, p8) and the WCR (1994, p18) concur with this definition of competitiveness.

2.5.2 Global

Before a country can compete globally, it must identify areas in which it has comparative economic advantages, which give it a regional or international margin. These areas may be human or natural resources, manufacturing, or location. IT can enable countries to change the relative advantage of particular economic areas. The software industry in India is an example of a country that used IT in the form of fast, trouble-free electronic communications to take advantage of its talented programmers (Miller et al, 1996).

Al Gore, vice president of the USA (1995, p5) says one cannot create healthy competition by excluding competitors, whether those competitors are at home or abroad. Vigorous global competition creates jobs.

All future competitive capability has to be at the global level. It is no longer enough to be effective at home. If a company is not highly competitive outside it's own country and does not hold a satisfactory share of the Triad (Europe, US, Japan) market it can be beaten on its home ground by competitors who have the advantage of being world leaders says De Woot (1990, pp11-12). For any country to compete in the world economy, it must develop the infrastructure that will enable it to compete equally (Song and Akhtar, 1995, p62).

The field of competition is global in many areas, but nowhere more so than in IT where the software products themselves can often be directly distributed over the networks (Blake, 1996). Two important tools are emerging to deal with the globalisation of

competition: first, mastery of IT progress and innovation and second, international co-operation says De Woot (1990, p13).

It is impossible for a country to effectively compete in the world market today without a modern and efficient information infrastructure. Kenney (1995, pp37-38) believes that it is imperative for all countries to become active participants in the information revolution if they wish to achieve or maintain a globally competitive advantageous position. Economic survival will be closely linked to the extent that countries develop competitive advantage by making maximum use of IT and information. All countries have to plan toward economic growth and survivability, and to do this they should be looking at ITPs as one of the plans needed.

2.5.3 Types of Competitive Advantage

The globalisation of competition has lead highly efficient companies to develop advantages specifically directed towards international competition. MNCs go well beyond Porter's generic strategies and seek to create new competitive weapons. They take advantage of their presence in a number of countries, and exploit the comparative advantages they offer. They strive to achieve a size which can take advantage of world economies of scale, and develop activities and resources to achieve economies of scope which optimise strategic investment in R&D, marketing, organisation, management, etc. (De Woot, 1990, p14).

2.5.4 Methods to increase competitiveness

Thahane and Amin (1994, p206) state that IT is an important method of increasing and maintaining competitiveness. IT provides the means for gathering, acquiring and using information to maintain competitiveness. IT has penetrated every corner of the economy, and is furthering competitive advantage by establishing links amongst suppliers, manufacturers and clients, and reducing the need for large inventories and the associated overhead.

Den Hertog and Fahrenkrog (1993, p1) say that policy debates on the relationship between technological change and competitiveness have stressed that it is not so much access to technology, as the capacity to innovate and diffuse technology which increases competitiveness. Hanna and Dugonjic (1995, p32) write that technological change is acknowledged as a key source of industrial competitiveness and economic growth.

De Woot (1990, pp165-6) says a few large scale government projects which create demand for high technology could increase competitiveness. The US and Japan have managed to combine large public aid with genuine competition.

Sustainable competitive advantage can only be achieved in one of three ways says Kennedy (1995, p5):

- through unique and copy-proof products or services such as xx86 Intel chip. Usually these products or services have a short life cycle.

- through unique and unassailable channels and distribution mechanisms, i.e. monopolistic enterprises such as Escom, but the global market is rapidly eliminating monopolies,
- market beating responsiveness to opportunities. This is the advantage of getting into a market first - of being the market leader.

As governments act to promote the competitiveness of their economies, they see the need to establish a climate for innovation. To make companies and institutions more innovative requires attention to a list of policy items which includes:

- Broad framework policies that are favourable to innovation,
- Human resource policies,
- IT policies (Mullin et al, 1992, pp10-11).

The issue isn't whether a country should have an IT policy, but rather what kind of government policies and programs make sense in the new competitive environment according to Branscomb (1992, p24).

2.5.5 Competitive questions

Perez (1992, pp11-12) lists six questions which arise when a country is planning to develop a national plan for IT, and thus has to face competition from other countries' policies:

- What is the best legislation for entry into the competitive international market?
- Which countries' experiences should be imitated?

- What stops us repeating their formula?
- How much political and legislative good-will, and what skills and internal savings efforts, are required to make this successful?
- What factors are open to negotiation with MNCs?
- How sensitive are the government, and various interests groups, to the fact that lack of interest or investment in IT in the strategic areas of the economy, could have grave long term social consequences?

Other questions raised by Perez (1992, p12) relate to the type of IT industry the country wishes to develop - hardware or software. High quality, low prices, aggressive marketing strategies, and continuous technological innovation are the basic needs for a hardware industry to remain competitive. A software industry requires more human resource skills such as intelligence and creativity coupled with staying abreast with leaders in the international development of hardware and software. The questions are then how many of these factors does the country possess, and how long will it take to acquire the remaining factors required?

2.5.6 Competitive Rankings

On the world competitiveness scoreboard for 1994, South Africa was ranked 35 out of 41 (WCR, 1994, p174). South Africa slipped in the World Competitiveness Report rankings to 42 out of 48 countries in 1995 (WCR, 1995, p274).

One of the key signals to emerge from the World Competitiveness Report was that there was no country which had improved its ranking by accident. Countries had achieved it through national strategy (Klein, 1995, p33). South Africa needs a national IT strategy to improve its ranking.

2.5.7 Changing rules of world competitiveness

The opening of world markets, revolutionary new technologies, plus new management methods are destabalising people, companies and countries. These developments have changed the rules of competitiveness. Professor Garelli (WCR, 1994, pp 8-13) addresses ten items which he claims describe a new world of competitiveness:

- Economic growth is perhaps no longer the core issue. In Europe the economy is growing, but it does not seem to create jobs and incomes anymore. The new rules of competitiveness are changing the way national economies operate. As a result of 3 major revolutions (globalisation of the economy, technological revolution, management processes) economic mechanisms are being transformed
- The opening of world markets is creating serious challenges for many countries and companies. Countries with low-cost labour will attract many industries. South African labour costs ranked 16 out of 48 in 1995 (WCR, 1995, p275), so this is possibly an opportunity for South Africa
- World markets are specialising. Countries are developing competencies on a global scale - for example Singapore for value-added logistics, India for software.

- Europe and the US will de-industrialise to an extent. It no longer matters in which country a company's manufacturing operations are located, as long as markets are guaranteed to remain open and the flow of goods, services and capital is ensured
- Relocation will also apply to white collar workers. Software is developed in India for sale world-wide
- Unemployment will remain high. Companies will continue to lower head counts to increase productivity and reduce costs
- Incomes are being destroyed. Wage fluctuation and increased taxation will decrease incomes
- Western governments are overspending. Most are running deficits in excess of 5% of GDP
- Job creation and growth will take place in the small companies. These companies will be linked by advanced IT networks to the central functions of large enterprises. As the boundaries of organisations fluctuate and change, the ability to manage partnerships will become a key competitive advantage
- Competitiveness is not only about economics. The importance of the softer part of competitiveness such as skills, education and culture is essential

IT is one of the major contributing factors to these changing rules, IT has enabled world markets to be opened up. As Garelli points out this has and will continue to destabalise people and countries. A country therefore needs to come to terms with these issues, and devise a strategy to deal with it - an ITP should be part of that plan.

2.5.8 Factors of competitiveness

The World Competitiveness Report (WCR, 1995, p27) measures eight factors of competitiveness which are measured through 381 criteria. The eight measures which will be used as part of the comparison of countries in chapter four (and were listed in section 1.2.3) are:

- Domestic Economic Strength
- Internationalisation
- Government
- Finance
- Infrastructure
- Management
- Science and Technology
- People.

2.5.9 Rules of competitive society

Competitive societies follow ten golden rules according to the WCR (1995, p11). They

- Create a stable and predictable legislative environment
- Work on a flexible and resilient economic structure
- Invest in traditional and technological infrastructure
- Promote private savings and domestic investment
- Develop aggressiveness on international markets as well as attractiveness for foreign value added industries
- Focus on quality and speed in the conduct of administration and reform

- Maintain a relationship between wage levels , productivity and taxation
- Preserve the social fabric by reducing wage disparity and strengthening the middle class
- Invest massively in education especially at secondary level and in lifelong training and improvement of the work-force.
- Balance the economy of globality and the economy of proximity to ensure wealth creation, maintain social cohesion and preserve the value system citizens desire.

South Africa needs to examine these ten rules and apply them where necessary. In order to fully follow these rules, and maximise benefits, an ITP is required. No country should invest in IT infrastructure without a plan. International markets cannot be developed without IT. IT is essential to speed up administration, and can play an invaluable role in education.

2.5.10 Examples of South African Innovation

South African entrepreneurs have designed and developed some excellent IT products. These include hardware products such as printers and telephone systems, and various software packages according to Wood (1993, pp51&52) and Miller (1994, p11). Details of the products is given in the section (4.2.3.1) on IT Production in South Africa.

2.6 STATUS OF ITP IN SEVERAL COUNTRIES

"*All governments are engaged in policies that have an impact on the development of high-technology industries*" (Dedrick and Kraemer, 1995, p33)

2.6.1 Singapore

Singapore set up a committee on national computerisation (CNC) in 1980 to establish Singapore as a software centre in South East Asia. The CNC appointed a group to study the information needs of the civil service in the same year. A National Computer Board (NCB) was set up in 1981 as a statutory board under the Ministry of Finance. An ITP was launched in 1986, and the government has acted not only as regulator and co-ordinator, but also as a stimulator and participant in development and use of IT (Odedra, 1993, pp17-18)

Today Singapore is recognised as a world leader in national exploitation of IT says Miller (1994, p9), and according to the WCR (1995, p270), ranked second in the exploitation of IT. Her overall position in the WCR remained at 2 (WCR, 1995, p271).

Bjorn-Anderson (1994) reported that Singapore has subsequently launched an updated ITP, called IT Plan 2000, with 5 main points;

- Developing a global hub for goods, services, capital, information and people
- Boosting the economic engine and competitiveness of industries
- Enhancing the potential of individuals
- Linking communities locally and globally, and

- Improving the quality of life.

Christie (1995, p73) admits that Singapore is a spectacular economic success story, as well as a model for ITP development. However, its authoritarian government denies opposition, human rights and freedoms, and perpetuates an aura of fear. He questions whether Singapore's economic growth under such conditions can be sustained.

2.6.2 New Zealand

Kraemer and Dedrick (1993a, p365) write that ITPs in New Zealand have closely paralleled the broader economic policies of the country. New Zealand's economic policy was inwardly oriented, with high trade barriers and heavy government regulation until the mid-1980s. In 1984 a programme of economic liberalisation (deregulation, privatisation, and public sector reform) was implemented. This affected an implicit ITP which moved from centralised control and protectionism to almost pure laissez faire (free-market strategy). Under these new economic policies, IT spending has increased, ranking second behind Japan in the Asia-Pacific region for IT spending as a percentage of GDP.

Kraemer and Dedrick (1993a, p366) report that in 1990 the telecommunications sector was deregulated. Tariffs on IT were lowered from 40% to 10% and all import licence requirements were dropped. Government computing services are no longer centrally controlled. Each ministry controls its own IT destiny, and can outsource its IT to other state agencies or private companies, or run it themselves with no intervention from

central government. New Zealand does have an ITP Unit in the Ministry of Commerce (Jackson, 1995b) whose role is to develop policy to respond to IT-driven change in the economy and society, but not to develop an ITP.

New Zealand is a case study of a country which has taken free market ideology to an extreme . The results are not that encouraging in terms of economic performance. New Zealand's domestic economic strength dropped from eleventh to twenty second in the 1995 WCR (1995, p229), but their overall position improved from 9th to 8th. Kraemer and Dedrick (1993a, p386) wonder whether New Zealand can succeed when depending on exports of primary products that have limited growth potential, and face market barriers in much of the world.

2.6.3 Australia

Australia's treatment of IT has swung between *laissez faire* (market directed strategy) and strong Government plan directed strategy. The result is that there is a mixture of policies which affect IT, rather than a coherent strategy according to Dedrick and Kraemer (1993, p333).

They (Dedrick and Kraemer, 1993, p337) believe that Australia's decentralised political system, has made it difficult to develop and implement an IT policy.

Australia has no policies to promote private sector use of IT. It also has no industry co-ordination through any agency such as Singapore's NCB (Dedrick and Kraemer,

1993, p346). In spite of this Australia has improved its overall position in the world competitive rankings by one place to fourteenth (WCR, 1995, p55).

2.6.4 India

Indian policies discouraged imports, stressed self-reliance, and protected local industry. Since 1991 regulations and duties have been reduced, and software exports encouraged. The Department of Electronics is the primary agency overseeing government ITP formulation and implementation, but they do not have much control over the industry. Local industry is protected by heavy duties on imports (107% on PCs, 85% on software packages). The result is IT prices are extremely high and India suffers from under computerisation (Nidumolu and Goodman, 1993, pp 15-21).

The generation of human resources for IT has been one of the key elements of India's national policy. The education system was not providing the right type of computer literate manpower. A computer education scheme was launched in 1991 to generate suitable manpower in IT. The effect has been increased software exports according to Bagga and Veena (1994, p109). However, Hanna (1995, p524) says almost 60% of IT graduates in computer science from Bombay and Madras leave the country for further studies or jobs overseas.

The Indian company, Tata, has become a company that many hardware and software vendors rely on for software development says Heydenrych (1994, p6). A 1992 study funded by the World Bank showed US and European IT vendors ranked India very

highly for software development (Nidumolu and Goodman, 1993, p16). For the year 1992-1993 the Indian software industry showed a growth of over 37 % over the previous year according to Bagga and Veena (1994, p114). However, software piracy, says Hanna (1995, p524), has forced some companies, such as Wipro Systems, out of the domestic packaged software market in India, and is likely to force others out soon. Lotus estimated that 93% of all copies of 1-2-3 in India have been pirated.

Countries such as India which promoted domestic IT production through protection, have caused users, taxpayers, and foreign producers heavy costs (Dedrick and Kraemer, 1993, p336). In the most recent World Competitiveness report, India ranked lower in all eight factors than she did in 1994 (WCR, 1995, p163).

2.6.5 Brazil

The Brazilian ITP is based on the "Market Reserve" system, a unique and highly protectionist policy that severely limits the importation of IT and encourages domestic value added by Brazilian-owned manufacturers (Reinecke, 1995, p1).

Perez (1992, p9) summarises the Brazilian Informatics Policy as pursuing three objectives:

- The technological development of the electronics industry
- The development of an assembly capacity for computer manufacturing
- The development of a technological know-how.

Roche (1990, p1) says one of the key factors influencing the extreme protectionism in Brazil is the desire to develop a national IT industry. By providing protection to its software, IT equipment and telecommunications sectors, Brazil believes a strong domestic IT industry will flourish . The effect of this policy he says, has been to raise the cost of much of the equipment by 3-5 times the open market price. It has also retarded the transition to more advanced applications such as on-line processing. On the other hand, the policy appears to have been a success as it has built up a large IT industry without substantial government investment (Roche, 1990, p2).

Lebra La Rovere (1994, p75) calls for public support for work force training in firms, an official procurement policy devised to stimulate competitiveness in informatics and communication equipment, and deregulation of the telecommunication sector.

Brazil's overall rating in the World Competitiveness Report has risen one place to thirty-eight (WCR, 1995, p73).

2.6.6 Chile

Chile adopted an essentially free market approach to IT, in that public and private institutions are free to make their own decisions about how they employ IT. A National Informatics Policy was created in 1975 in Chile which encourages and facilitates the use of IT. Chile's state-owned National Computing Centre (ECOM) was responsible for:

- the introduction of informatics
- encouraging the use of informatics in the public sector

- training specialists
- providing the necessary computer processing capacity for the public sector
- approving projects requiring IT imports (Perez, 1992, p10).

National Informatics Policy was established in 1975, and ECOM was made responsible for the following policy (Perez, 1992, p10);

- The State does not impose administrative or standards oriented guidelines re IT
- State agencies are free to develop any information systems they believe necessary
- There are no import quotas or discriminatory import duties for IT
- There is a tax reduction scheme for the training of human resources
- In several agencies, the State leaves all IT related activities to the private sector.

Chile opened its telecommunications market in late 1994. The number of carriers shot from 2 to 9, and demand rocketed. Calling revenues are rising at an annual rate of 14% - twice as fast as the national economy (Bidoli and Laing, 1995, p24).

Since 1985 Chile has reduced the size of government by over 60% using IT according to Baeza-Yates et al (1995, p29), and almost all Ministries are using IT for improved decision making.

Chile was ranked fifth in the exploitation of IT, and improved their overall position from 22nd to 20th in 1995 (WCR, 1995, p85).

2.6.7 Summary table of Policy Instruments employed

	Plan-Directed Policies			Market-directed		
Policy	Brazil	Sing.	India	Aus.	N.Z.	Chile
Import restrictions	*		*			
Export promotion		*		*		
Foreign investment incentives		*				
Technology transfer requirements	*		*			
Foreign investment restrictions	*		*			
Subsidies to industry			*	*		*
Use of state-owned enterprises		*	*			
Favouring local producers in government procurement	*					
IT skills training	*	*			*	*
Telecomms investment		*		*	*	
R&D						
- Direct funding		*		*	*	
- Incentives to private industry	*	*		*		
- Creation of consortia		*				
Industry co-ordination		*				

The above summary table of policy instruments was expanded on from the original by Dedrick and Kraemer (1995, p49).

In summary, countries that followed plan-directed policies were more successful in hardware production, and there does not appear to be any difference between the two approaches for successful software production (Dedrick and Kraemer, 1995, p50). If one compares the competitiveness rankings of the two sets of countries, all the countries using market directed strategies improved their overall positions.

2.6.8 African countries

No ITPs exist which identify the needs of a nation, or which determine what may be achieved with the available resources. Some policies exist which typically mandate centralised acquisition for the public sector, and tax private companies to discourage imports or to raise convertible currency for the state (Odedra et al, 1993, p26).

Odedra et al (1993, p25) identify Africa as the least computerised continent. There is too much dependence on foreign IT and expertise, and most of the infrastructure and education offered is inadequate. Africa is plagued by extensive underutilisation of IT equipment. There are numerous examples of systems that are not being used because of lack of secondary equipment, suitable power, or training.

IT in Africa is largely dependent on MNCs and expatriates. African governments lack long term plans according to Odedra et al (1993, p26). The most pressing need in Africa according to Odedra et al is not new IT systems, but rather the know-how to effectively use what is already in place. Africa needs to acquire the ability to exploit the existing products effectively. Inadequate training and lack of experience is a major problem. Rich nations can afford inefficiencies, the poor nations cannot (Odedra et al, 1993, p27).

Africa's poverty continues to inhibit its economic attractiveness. The real per capita income in Africa fell 40 percent in the 1980's. Population growth continues to outpace GDP. The sub-Saharan nations' foreign debt increased during the 1980s, so that it is now larger than their GNP. The region's share of world trade is less than 50% of what it was

10 years ago. Few African countries have developed their manufacturing sectors significantly. There is a continuing tendency for rural dwellers to flock to the cities, resulting in high joblessness and marginal living conditions (Quelch and Austin, 1993, p108). The extensive emigration of scientific and engineering personnel from Africa is one of the legacies of Africa's stalled industrialisation (Davis et al, 1994, p45).

The spectrum of differences in Africa is large. Urbanisation ranges from 6 percent in Burundi to 60 percent in South Africa, the GDP per capita ranges from $8 in Mozambique to $2,530 in South Africa (Quelch and Austin, 1993, p116). The message is clear - if South Africa doesn't help grow it's neighbouring countries such as Mozambique, the exodus from them will swamp South Africa.

Munasinghe (1995, p481) says conditions in DCs suggest that without intervention, market forces would lead to a very slow pace of IT adoption, and given the high risk and fast changing characteristics of IT, these conditions would lead to under-investment in IT by most enterprises and institutions. Munasinghe argues that as the financial markets in many DCs are weak, a market economy alone may not bring the desired results. IT use and growth may lack uniformity and result in unsystematic and haphazard growth if left to a market economy. This may then dampen efforts to gain competitive advantage at the global level.

An integrated ITP is imperative for DCs says Harindranath (1993, p3) as it can pre-determine the role IT will play in development, deal with the acquisition and use of

IT, determine manpower resources and skills development requirements, define production facilities and R&D requirements. Harindranath (1993, p3) says, "While regulation may be a natural outcome of such policies, it should never be at the expense of development which is the larger goal of policy".

Given the very different conditions and issues from those of developed countries, neither a completely government-regulated nor a laissez-faire attitude would be effective for an ITP in a DC. A combination of approaches may be more suitable according to Munasinghe (1995, p481).

2.7 PREVIOUS AND CURRENT RESEARCH ON ITPS IN SA

"The government has not yet developed an information policy and lacks mechanisms to assess information technology proposals in the context of overall government objectives in general and the RDP in particular." (Harfoush and Wild, 1994, p13)

This section will review research into ITPs for South Africa done by Blake, Miller, the NITF, the NCLC, Harfoush and Wild, Moikangoa et al, DACST, and Wood. The RDP will be reviewed with special attention to IT.

2.7.1 NCLC

The Computer Users Council (CUC) spearheaded a national IT strategy and policy for South Africa in October 1992. This was then taken up by the National Computer Liaison Committee (NCLC). The NCLC is an umbrella body of five IT bodies in South Africa.

The NCLC, in their framework for a national IT strategy for South Africa, feel that an ITP is required to enable South Africa to "create and define it's competitive domain" (NCLC, 1994, p3). The guidelines they lay out state that both MNCs and small businesses must be accommodated. The NCLC is against a central government bureaucracy. An ITP must uplift all South Africa's people, support development and training, and protect rights to privacy and personal information (NCLC, 1994, p6).

The NCLC advocated that some form of institutional structure be created to take responsibility for a proposed national strategy. They saw the functions of such a body as including;

- Identifying, defining and co-ordinating national joint ventures and exploiting niche opportunities.
- Facilitating discussion and collaboration.
- Advising individuals and organisations on possible opportunities.
- Creating an environment favourable to entrepreneurship.
- Entering into collaboration agreements with foreign organisations (Monsieur, 1994, p13).

The NCLC proposed five focus areas in their framework (NCLC, 1994, pp7-9):

- Education & Training. Use IT as an enabling tool for school education, and prepare people for the workplace of the future.

- Establishment of a national IT infrastructure. Infrastructure to include national standards, facilitate the creation of applications, eliminate duplications and save costs.
- R&D. Establish collaborative agreements with international bodies which will hopefully lead to applied R&D.
- Development of national IT applications. Identify applications that will benefit South Africa. Examples of such systems include a comprehensive educational support system, national health system, national tourism system.
- Establishment of a local IT industry. This industry should aim at adapting foreign technology for local use, and development of products for export especially to African and other third world countries.

2.7.2 NITF

The National Information Technology Forum (NITF) was established in 1995. It was proposed that the NITF co-ordination committee consist of not less than 26 members, five each from Government, Labour, Civil Society, Public Enterprises, and Private Business, and two from the NITF secretariat (NITF, 1995a, p15).

It lists it's mission (NITF, 1995a, p1) as to offer proposals for IT policy options that would ensure the socio-economic development of all South Africa's people through universal access to IT, as well as the economic development of South Africa through a well developed, technologically sound and appropriate IT infrastructure. Such a policy

should ensure that South Africa strives to become an important component of the global information technology environment, capable of participating effectively internationally.

Some of the objectives of NITF are as follows (NITF, 1995b):

- To contribute towards the development of an appropriate ITP
- To promote interaction amongst members of the IT community and the public
- To create public awareness of the importance and uses of IT
- To promote the use of IT for improving the quality of life in South Africa
- To provide information and education to policy making bodies, individuals, and organisations, and to promote a system of lifelong interactive education and training
- To ensure IT is identified as an important development factor in South Africa
- To ensure that IT is recognised as a catalyst for economic growth
- To encourage the development of a coherent regional ITP for Southern Africa
- To promote the development of a viable IT industry
- To ensure that the rights of all citizens to IT and associated services is recognised
- To ensure that a national information infrastructure is developed and recognised as a national resource and asset whose use should be managed in the interest of all citizens
- To ensure that the imbalances existing in the provision of IT and associated services are corrected and that IT is used to correct existing inequalities
- To ensure international co-operation in R&D, as well as government funding
- To support small enterprises financially and through Centres of Excellence

- To develop a policy for intellectual and industrial property rights.

The NITF aims to achieve a balance between a focus on short term challenges and the formulation and implementation of a long term ITP framework and strategy within a year (NITF, 1995b).

2.7.3 Harfoush & Wild

This research was sponsored by the International Development Research Centre (IDRC) of Canada. Harfoush and Wild (1994, p11) state that any ITP proposal in South Africa must ensure that available information resources be focused on building an information management system to serve two broad communities. Government is the first, and its main need is for a system or systems that support the implementation, monitoring and evaluation of the RDP. Local communities require information which enables them to drive the development process according to their needs.

The policy must cover the constitutional requirement for access to information for the "protection or exercise" of rights of individuals. It must aim to make citizens aware of their new rights (Harfoush and Wild, 1994, p11).

Some issues that need to be addressed in a South African ITP are (Harfoush and Wild, 1994, pp15-17):

- Location of the policy and co-ordination function. Harfoush and Wild outline four solutions to this dilemma: locating the Policy unit in (1) the RDP office, or (2) an

inter-departmental committee, or (3) in the Ministry for Public Service and Administration, or (4) in one of the line departments such as Posts, Telecommunications and Broadcasting Services, or the Ministry for Arts, Culture, Science and Technology.

- Centralisation/decentralisation and ownership of information. Do the provinces or central government run and own the information?
- Charging for information? Conditions under which information will be made available to whom and at what cost if any.
- Legal and administrative framework. Legal instruments required to ensure government responds correctly to requests for information, and that confidentiality is maintained.
- Education and training. A survey of educational and training capabilities in the information field is called for.
- Language and literacy. The 11 official languages and low literacy rates requires that the policy promotes the production of information services that are broadly accessible.
- Involvement of the 'military industrial complex'. The capacity and capability to manage large complex projects should be utilised.
- Technology policies. Policies to deliver information to disadvantaged areas.

The report identifies the urgent need for a reliable set of data on South Africa, and suggested a minimal data set be obtained as soon as possible which is sufficiently reliable

for use in major planning and decision making processes (Harfoush and Wild, 1994, pp23-24).

2.7.4 Miller

Miller has written and presented several papers on ITPs for South Africa. He is an academic at the Graduate School of Business attached to the University of Cape Town. He is also a vice-president of the Computer Society of South Africa (CSSA).

Miller (1994a, p15) calls for the formulation and implementation of a national ITP with two fundamental goals:

- to maximise the potential of IT to improve the quality of life and potential of the disadvantaged section of South African society
- to improve South Africa's competitiveness.

Miller (1994a, pp15-16) lists two prerequisites to successful ITP formulation as

- a thorough understanding of South Africa's IT endowments
- a comprehensive picture of all significant policies and policy instruments in place or planned for IT and telecommunications.

Miller makes no formal recommendations for an ITP, but he does make suggestions as to what could appear in the policy. He suggests the following seven categories for an ITP (Miller, 1994a, pp16-19):

1. Launch initiatives to create a climate conducive for widespread exploitation of IT. Initiatives might include:

- Establishment of IT awareness centres and media campaigns
- Installing and using IT in schools, and distance learning pilot-projects
- New IT training institutes
- Programmes to legislate on data privacy issues.

2. The public sector could:

- Undertake pilot projects
- Ensure integration and interconnectivity of IT between state departments
- Define and implement a national health information system
- Co-ordinate plans for wide spread-use of IT in education
- Establish a co-ordinating body to sponsor, define, implement and manage a national ITP
- Develop an information policy covering the nature of state information and the accessibility of that information to society.

3. The National Telecommunications Infrastructure. Miller reiterates the proposals of the National Telecommunications Forum which included:

- Universal service for small businesses, the informal business sector and the disabled and disadvantaged communities
- An independent statutory regulatory Telecommunications Authority with powers of enforcement

- An industrial policy to promote a globally competitive telecommunications industry
- Affirmative action in the industry through pro-active training and development and recruitment and advancement
- Cost and usage-based telecommunications tariffs, with the possibility of transitionary cross subsidisation
- Adoption of international standards and encouragement for international investment in South Africa
- The use of broadcast satellites to distribute educational materials throughout the country.

4. IT R & D policies could include:

- Tax credits, low interest loans and venture capital to encourage R & D
- Collaborative planning between research communities, industry and government
- Encouragement for local researchers to travel and see latest developments.

5. Technology transfer initiatives could include:

- Financial incentives encouraging technology transfer
- Grants to foster collaborative research projects
- Incentives to MNCs to operate in South Africa including tax holidays, cheap land for production and assembly plants, incentives to employ and train locals, excellent communication infrastructure, simplified local procedures, free trade zones
- Support for legislation to protect intellectual property rights
- Co-ordinated efforts to source international donor aid for IT projects

- Subsidies to encourage technology transfer to small to medium size enterprises.

6. The electronics industry appears under-developed in relation to South Africa's need for electronic components. Policies and instruments could include:

- Tax credits to expand development facilities
- Accelerated depreciation for development and innovative equipment
- Tax credits for locally designed and/or manufactured equipment purchases
- Grants for development and innovation
- Export incentives and assistance with overseas marketing
- Tax holidays for key new enterprises
- Education and training grants
- Tax concessions for approved training schemes.

7. The manufacturing industry in South Africa has to better exploit IT, this might include:

- Similar incentives for those listed for the electronics industry
- Encouragement to collaborate with R&D establishments
- Venture capital for IT related pilot projects
- Training incentives
- Rapid depreciation of IT
- Subsidies for the use of IT in manufacturing.

Miller's (1994a, p19) overall recommendations re an ITP are for the South African government to:

- Initiate inclusive and broad discussions of the role of IT in the reconstruction and development of South Africa
- Prepare to constitute a single co-ordinating body to oversee a national IT policy
- Fund a detailed national survey of IT endowments of the country
- Initiate a study to detail all IT related policies, regulations and the like currently influencing the exploitation of IT
- Commission the preparation of a white paper on a national IT policy for South Africa.

2.7.5 Blake

Blake has written and presented papers on ITPs for South Africa. He is an academic at the University of Cape Town.

Blake (1995, p1) argues that South Africa cannot afford further underdevelopment in IT due to the lack of an effective IT Policy. He states that South Africa's strength in IT lies in an advanced IT infrastructure and limited but real strengths of IT expertise. The lack of an ITP will lead to ineffectual and retarded development, and according to Blake the effects are already visible in the lack of applicable IT research.

Blake (1995, p2) states that "The only feasible strategy for a country with limited resources is to maintain expertise in identified key fields, keep track of other areas and

preparing South Africa to contribute to the African and global information societies (Moikangoa et al, 1995, p1). They add (pp2-3) that South Africa needs to understand the implications and impact of globalisation, which include increased competitiveness, efficiency and opportunity.

Information sharing between government departments, between the government and the private sector and between individuals, will improve the agility of entrepreneurs.

Increased access to government information will lead to greater accountability, democratisation and quality.

Education is an area where IT can have a great impact in South Africa. The CSIR is working on pilot distance learning projects (Moikangoa et al, 1995, p4).

Moikangoa et al (1995, p7) state that South Africa needs to attract local and international private investment to increase competitiveness and provide better and cheaper IT. South Africa needs a national IT assessment to identify any current constraints on effective use and extension of our IT infrastructure, and whether the constraints are financial, legal or regulatory. The assessment would further identify the full range of opportunities and comparative advantages that could make the IT sector more competitive. Finally it would identify and select achievable goals and targets for the short, medium and long term.

The global trend is towards liberalisation and privatisation of telecommunications infrastructures, and Moikangoa et al (1995, p9) recommend South Africa consider this.

Governments need to redesign themselves using IT to become more 'user-friendly' and open to local and foreign investment and input. Moikangoa et al (1995, pp9-10) caution against unnecessary duplication of information between the different government levels in South Africa.

Moikangoa et al (1995, p13) recommend a high level group on the Information Society in South Africa be constituted. It must include a senior representative from each cabinet department and from each province. This group would promote IT throughout government and ensure that every department is addressing the issues from their department's particular vantage point. Representatives from academia, research institutes, media sources, the private sector (local and global) and the financial sector should be included.

2.7.7 DACST

The South African Department of Arts, Culture, Science and Technology (DACST) committed itself to, and issued a discussion document on a Technology Foresight Programme in 1995. The detailed design must be the subject of a large scale consultation exercise. The government must take the lead in design, whilst providing opportunity for wide consultation (DACST, 1995, p1).

The aim of Foresight is to "contribute to an improvement in the economic well-being and quality of life of all the people of South Africa". It must also help improve the distribution of economic and social benefits. Foresight seeks to achieve this by:

- Identifying technologies and hidden market opportunities most likely to benefit South Africa
- Gaining consensus from all to particular technologies
- Agreeing actions which will lead to beneficial breakthroughs in specific fields.

Foresight's purpose is not to passively identify trends and reinforce them so benefits are achieved, but to take action to shape the future (DACST, 1995, p1).

The actions that need to be taken include (DACST, 1995, p2):

- More investment in specific fields of research by government and industry
- Identification of research fields where international collaboration is desirable
- Legal and regulatory framework changes to encourage the development of particular markets or technologies
- Government procurement changes
- Changes in the education system to supply the future skills needed.

Foresight must identify market and technological developments that will be important specifically to South Africa (DACST, 1995, p2).

2.7.8 Wood

Wood is an academic at the University of Arizona who has done research on IT in South Africa.

Wood (1993, p5) believes the South African leaders will rely heavily on information to preserve and stimulate the first world economy while rapidly integrating the disenfranchised majority. The survival of the entire South African economy rests on providing decision makers with accurate, useful, and timely information. This will require carefully thought out IT policies that reflect the shared vision of all citizens. Wood's (1993, p5) working premise is that optimally, IT integration should occur at local, national and international levels.

A major criticism against the previous government was the total absence of public policy that could potentially guide the activities of institutions attempting to redefine themselves given the new political realities. Wood comments that there are no official agencies governing IT (Wood, 1993, p19), and suggests that IT development will be strongly effected by public policy (Wood, 1993, p27).

Wood (1993, p37) states that of all the activities occurring across the government, educational and industrial landscape, the global connectivity provided by the Internet is one of the most critical and successful ways in which South Africa is being reintegrated with the world.

IT in schools, for use by both students and the wider community is encouraged (Wood, 1993, pp49-50).

Wood (1993, p52) comments that intellectual property rights laws need strengthening.

2.7.9 RDP

The RDP will form the basis of all future government policies, so it must be reviewed as it's comments cannot be ignored. The six principles of the RDP were listed in section 1.2.5 of this dissertation. Section 4.4.8 of the RDP (ANC, 1994, pp96-98) deals with technology policy, and will be examined first. Thereafter other sections of the RDP will be looked at for references to IT. Some additional comments on the RDP will also be reviewed.

The RDP (ANC, 1994, p96) states that technology policy is a "key component in both industrial strategy and high-quality social and economic infrastructure". An ITP will be a key component of a technology policy, and so it should satisfy all the criteria listed for a Technology policy.

Raising productivity is a critical requirement for a technology policy.

The RDP (1994, p96) lists the following broad objectives for a technology policy:

- Develop a supportive environment for innovation
- Reverse the decline in resources
- Enable the economy to compete internationally

- Ensure that technological advances are converted into useful applications
- Humanise technology to minimise the effect on working conditions and employment.

Examining these objectives, it is clear that an ITP could satisfy all of them. IT R&D would contribute towards an innovative environment. The loss of human resources could be slowed by IT providing the stimulus needed to keep them in South Africa. South Africa cannot compete internationally without IT. IT applications in health and education are not only useful, but also improve the quality of life. IT could improve working conditions in several areas by reducing mundane and dangerous work.

The RDP (ANC, 1994, p97) insists that companies must be linked to facilitate innovation. IT is the only way to achieve this. Pre-competitive collaboration between local companies and the public sector should receive government support (ANC, 1994, p97).

Section 4.4.8.4 (ANC, 1994, p97) says there should be incentives for companies to expand their technological capacity. Unfortunately no details are given as to what these incentives could be. It also says that small and micro enterprises must get a larger share of government initiatives related to technological development, knowledge acquisition and training.

Section 4.4.8.6 calls for legislation to ensure that imported technology includes a commitment to educate and train local labour to use, maintain and extend the

technology. Commitment is not defined, and it must be born in mind that any such legislation will cost the purchaser, as the importer will simply add on a fee for conforming to this legislation. Excessive payments of royalties and license fees should be limited.

The RDP calls for research into appropriate and sustainable technologies for use in rural areas. IT is a universal technology which can be used in all areas.

It also suggests that the military/strategic technological production be redirected to civil areas.

Finally the section on science and technology suggests that a foresight program should be developed, and that there should be a strong co-ordinating government agency for science and technology (ANC, 1994, p98), but it omits to identify the agency.

The RDP was then examined by categories such as education and training, with the aim of extracting references to IT.

1. Education and Training. The first mention of technology is on page 8, and refers to advanced technological training. All schools are to have telecommunications services within two years. An ITP is needed to achieve this. The establishment of a statutory qualifications' authority with responsibility for accreditation, certification and the maintenance of national standards is called for (ANC, 1994, p61).

2. Telecommunications. The RDP aims "to develop a modern and integrated telecommunications and *information technology* system that is capable of enhancing, cheapening and facilitating education, health care, business information, public administration and rural development, and to develop a Southern African co-operative programme for telecommunications" (ANC, 1994, p34). It would make sense to co-ordinate this, so that one infrastructure serves all these sectors.

The development of an advanced public information network using fibre-optic, satellite, and microwave links is called for, as is a strong telecommunications manufacturing sector (ANC, 1994, p109). Should South Africa develop such a manufacturing sector? Does she have the expertise?

3. Statistics. The lack of accurate statistics on South Africa is noted on page 17.

4. Health. A National Health Information System (NHIS) is to be developed and implemented. The NHIS must ensure that accurate and comparable data are collected from all parts of the health system so that this data can be analysed at various levels. The RDP calls for the establishment of a National Advisory Board on health technology, which, amongst it's other functions, is to advise on regulations governing the importation and use of expensive technologies (ANC, 1994, pp44-49).

Mechanisms must be established for sharing information. A programme of research to improve the effectiveness of health service must be initiated. Health worker training is

seen as an important part of the RDP (ANC, 1994, pp 50-51). IT could assist in this training. The American Nurses Association insists that all nurses spend time on working with software which simulates situations.

5. Political. A negotiating forum between Government, organised labour and business should be established to co-ordinate issues such as policies and trade, and industrial and technological strategies (ANC, 1994, p 91). Technical co-operation with neighbouring states should be encouraged (ANC, 1994, p 118).

6. Public Service. The re-incorporation of the former "independent" states and self-governing territories into new structures is to receive urgent attention (ANC, 1994, p 123). Segregated local authorities must be amalgamated into new local authorities (ANC, 1994, p 129). This is a major IT challenge, and should be well planned.

7. Small Business. The section on small businesses (ANC, 1994, pp 94-96) calls for policies that would enhance the competitiveness of these enterprises.

8. Information Technology. The RDP aims to develop a modern and integrated information technology system as quoted in section 2.4.2. (ANC, 1994, p 34). This implies a National ITP will be developed.

IT must facilitate the advancement of education, healthcare, recreation and other services by improving the quality of information available, and providing access to expertise. IT

must link South Africa to the information highways to reintegrate her into world markets. South Africa could then provide this link to the rest of Africa. The RDP considers information a commodity of great significance (ANC, 1994, p 108).

9. Economy. Policies must be developed to ensure that foreign investment creates as much employment, technological capacity and real knowledge transfer as possible. Technology must enable the economy to compete internationally (ANC, 1994, pp 93-96).

10. Technology transfer. Technology transfer includes employment and real knowledge transfer (ANC, 1994, p 93).

11. Environment. The RDP (ANC, 1994, pp 38-41) makes suggestions for revising current legislation and monitoring industry activities which impact on the environment. Tools such as Environmental Information Systems could be used to monitor these activities.

What was not said:

ITP was not mentioned, but not every government policy was mentioned. The author does not believe that this was an omission, rather an oversight. No mention is made of software development and export, tariff structures, or the IT service industry. Disappointingly there was no reference to the role IT could play in education through

computer based training, or to IT as a school subject. The issue of deregulating the telecommunications industry did not appear.

Additional comments on the RDP follow.

The list of over 170 RDP operating projects range from adult basic education and training, to the creation of national e-mail (Smith, 1996, p28).

The Science and Technology Green Paper (S&T Green Paper, 1996, section 9) comments that the successful implementation of the RDP depends on the South African public service sector having an appropriate number of trained and experienced scientific, engineering and technical staff. This staff is needed to ensure maximum and efficient utilisation of all resources. The Paper adds that a prerequisite for economic growth in South Africa is a technologically fluent workforce.

The biggest challenge facing the RDP is to make a tangible difference to the quality of life of the marginalised people in rural areas and in urban townships and squatter camps. Above all, it should offer some opportunity or hope to the large number of unemployed people who have had little formal schooling of any quality. (S&T Green Paper, 1996, section 10.5).

An effective information infrastructure will help the RDP by allowing South Africa to leapfrog developmental stages, create jobs and increase industrial and commercial competitiveness (Blake, 1996).

2.7.10 Limitations of Previous Research

One of the limitations of the previous research is that most of it which is specific to IT is based on one or two individuals knowledge and experience. None of the articles has conducted a survey of opinion makers within the country, or looked at previous research done on ITP in South Africa.

Some of the research is dated and no longer current. None of the research takes recent developments such as the COPINE initiative (see next section) into account.
Most of the research does not mention the proposed National Health Information System (NHIS), or other proposed government systems. The RDP which is the key policy document for South Africa is not mentioned in several of the research documents. Few mention which department or Ministry should control an IT Policy. Some of the articles make no mention of the poor data on South Africa's IT endowment, not to mention poor overall data on South Africa.

The NCLC's proposal is a useful overview on ITPs, although it is very brief and contains little substance. The NITF is a recent player, and sets out some good objectives. It provides no framework and appears to be biased towards government. Harfoush and Wild's research was directed more towards information rather than IT. Miller's research

was, in the authors view, the most comprehensive. Good suggestions were provided as to what an ITP should contain. Blake's articles focused on R&D in ITPs. Moikangoa et al were understandably very supportive of the government, as they are government employees. Wood did not give any recommendations re ITPs.

2.7.11 Additional items to consider

Many authors including Du Toit (1994, pp47-49), Harfoush and Wild (1994, pp23-24), Odedra (1993, p33), Miller (1994a, p15) and Montviloff (1995, p444) agree that an inventory of South Africa's IT applications, data bases, hardware, telecommunications infrastructure and projects needs to be compiled, in order for government to prioritise IT requirements.

ITPs need to be regularly reviewed say Munasinghe (1995, p484) and Montviloff (1995, p443) to ensure all relevant new opportunities and risks are taken into account. If necessary the policy must then be revised.

The University of South Africa (UNISA) aims to introduce a programme called Students-On-Line (SOL) in March 1996. SOL will provide many services normally only available via the postal services or by visiting the campus. SOL will be available to anyone with a PC and Internet (Cape Times, 27/2/96, p1). A US$1,7m adult-education campaign to teach matric via satellite television was launched on 26/2/96.The insurance company Sanlam is funding the project called Power Matric. In the Western Cape, 31 learning centres have been set up in urban and rural areas. "Census figures show that over three-quarters of the South African adult population does not have a matric

qualification" said Desmond Smith of Sanlam. The Power Matric programme is an attempt to solve the problem by harnessing technology (Cape Times, 27/2/96). Is government aware of all the IT initiatives taking place in South Africa?

The RDP (ANC, 1994, p92) and various other papers like Blake (1995, p1) call for greater investment in R&D, but do not give an indication of by how much. Adam (1995) says South Africa needs to spend 2% of GDP on R&D.

AT&T South African President Franklin Coleman, says "By pursuing a policy vision that will lead to a competitive telecoms marketplace, South Africa can obtain lower cost, more innovative and higher quality services". Coleman sees a fully competitive environment as the best way to achieve universal service (Bidoli and Laing, 1995, p24). Telkom offers cheap local calls. An average of 77% of all calls are local, yet account for 17% of earnings. This subsidised rate is servicing an urban, primarily white population say Song and Akhtar (1995, p58).

Telecom '95 had two key messages for Africa, one on policies and one on technologies. The message on policies is that the days of state telecommunications monopolies are over. Governments, not state monopolies, vouch for universal access. The message on technologies is that telecommunications access can be delivered to any place, by any player, and in any bandwidth (Telecon Africa Bulletin, 1995, p2)

Prior to the liberalisation of the South African cellular market, Telkom offered an analogue cellular service to 11 000 subscribers in a limited area. Since the liberalisation of the market in 1994 more than 400 000 customers have subscribed. Handset prices have fallen, service has improved and new value-added services are available. Thousands of jobs have been created, and local and foreign companies have invested huge amounts according to Bidoli and Laing (1995, p27). The two cell companies agreed to install 30 000 community phones, and each invest over US$0,26 billion in South Africa by the year 2000 (Song and Akhtar, 1995, p58).

Currently there are at least four telecommunications infrastructures in South Africa. In addition to Telkom, Escom (South Africa's electricity parastatal), Transtel (the telecommunications subsidiary of the government-owned transport parastatal) and South African National Defence Force (SANDF) all maintain their own infrastructures. Escom has extended its infrastructure into rural areas. Transtel recently purchased transponders on a new satellite to be launched over South Africa in 1995. An opportunity exists to extend the national infrastructure by linking these infrastructures. A CSIR report identifies the potential and demonstrates the technical feasibility of interconnecting these infrastructures (Song and Akhtar, 1995, p59).

Many authors including Song and Akhtar (1995, p61), Goodchild (1995, p4), Spier (1995, p1) and Smith (1996, p30) say the establishment of community centres which offer a range of networked IT services to local communities, and include schools, clinics, libraries, welfare offices, courts, government offices, shops, small businesses, telephone

shops, recreational facilities, and electricity and water points all in one centre is a worthwhile idea. Korpela (1995, p24) cautions that unless the citizens are involved in the design, implementation and operation of these centres, and that the centres serve their needs, the centres will not work.

Spier (1995, p1) takes the community centre further and proposes establishing a Digital Utility Corporation for Southern Africa (DUCSA). DUCSA would use a satellite system to link community centres. It would own the hardware, and lease the utilities and local networks to community organisations and local users, who could then run them as locally owned businesses.

Spier (1995, pp6-8) suggests that key application areas for DUCSA would include:

- Youth development programmes, to provide them with meaningful knowledge, skills and work
- Education and training - via Local Area Networks (LANs)
- Health services such as tele-radiology, tele-dermatology, tele-ophthalmology, tele-cardiology and tele-pathology
- Housing and community development
- Agriculture and rural development
- Financial services which would include pension payments
- Entertainment, sports and culture using video transmission.

The South African government has committed to COPINE (A Co-operative Information Network linking Scientists, Educators, Professionals and Decision Makers in Africa), a United Nations initiative that addresses the collection, transmission, distribution and exchange of information needed for national development in a country using a satellite based information system. The estimated cost of implementing Copine is US$24m over 2 years, and the estimated operating cost over 5 years is approximately US$21.5m. Priority application areas are health care, agriculture and related food and security issues, the management of natural resources and the environment, education and science and technology (Copine, 1995, piii).

COPINE (Copine, 1995, p1) aims to link 12 African countries (Botswana, Cameroon, Ethiopia, Ghana, Kenya, Morocco, Nigeria, Senegal, South Africa, Tanzania, Tunisia, and Zimbabwe) with selected hospitals, universities/institutions and documentation/information supply centres in Europe and elsewhere .

Copine health-care would aim at (Copine, 1995, p11):

- Improving health care within rural areas
- Facilitating, monitoring and co-ordinating national and regional health care activities
- Supporting the training of medical staff in rural areas .

Braa and Power (1995, p138) report that the Kaiser Family Foundation is funding a pilot implementation of HealthLink (the South African version of HealthNet) in three provinces.

Major government IT initiatives are underway as evidenced by the tenders for the new National Health Information System (short list expected in first quarter of 1996), new fingerprinting system for the Police in 1996, new drivers licensing system (tender closed at end of 1995), and a national identity card tender is expected to get the go ahead soon (Sergeant, 1995)

Capacities and methodologies which exist within the military industrial sector should be used to manage, to time and to budget large complex projects (Harfoush and Wild, 1994, p16).

South Africa must look at Africa as an export market for it's expertise and technology. Song and Akhtar (1995, p56), Goodchild (1995, p10) and Quelch and Austin (1993, p110) state that South Africa has the potential to be a catalyst for development in Africa.

Some developing countries, are making use of build-operate-transfer arrangements. MNC's are invited to enter the country and build needed infrastructure. The MNC is then granted a concession to collect tolls or fees for use of the infrastructure until it's cost has been paid off. Thereafter the infrastructure is handed over to the DC and the

deal is completed. Thailand is using this approach for building its road infrastructure (Roche and Blaine, 1994, p485).

Chiang (1995, p36) cautions that a critical constraint on government policy arises from the nature of IT itself. A country's IT system is a complex system that operates through many private initiatives, the judgement of many professionals, as well as government bodies. Munasinghe (1995, p481) agrees with Chiang (1995, p36) that this system is not conducive to top-down central planning or to decision making from a distance by bureaucrats. To be effective ITPs must be tailored to the situation.

How many more IT initiatives such as NHIS, Copine, HealthLink and DUCSA are currently underway in South Africa which all propose to address health issues? How many IT initiatives in education are currently underway, apart from SOL and Power Matric? Does anyone know, is anyone in control? How many other initiatives in other sectors are being planned somewhere?

2.8 FRAMEWORKS TO COMPARE ITP BETWEEN COUNTRIES

"If we are to cope with the turbulence of life today, we must start by finding a way to organise it in our minds." (Handy, 1994, p 22)

When faced with a mass of data, impressions, ideas and perceptions, we need to put it into a framework to deal with the system. (Handy, 1994, p 22). There is a huge volume of data on IT policies that needs to be put into some sort of framework.

The literature was searched for frameworks to compare ITPs between countries and which could help answer the question: Does South Africa need an ITP? This report will look at five frameworks and then synthesise the results.

2.8.1 Plan versus market

The plan versus market directed distinction provides a theoretical starting point for analysing and comparing IT production policies in different countries. Strategies toward IT production can be characterised as plan-directed or market-directed economic strategies.

The drawbacks to this framework are firstly the ideological baggage attached to the term 'plan directed', secondly that a country does not necessarily fit exclusively into one group or another, thirdly that the two sets are sometimes seen to be mutually exclusive (Dedrick and Kraemer, 1995, p33), and finally that the focus is on IT production.

Plan-directed strategies are based on the idea that the market is a tool for achieving economically and socially desirable objectives, and that the government has a role in directing the market towards such objectives. The market is treated as a means to achieve the government's determined ends. Government policies are aimed primarily at economic and industrial development. An economic 'pilot agency' such as Singapore's Economic Development Board usually designs and implements industrial policy. Plan-directed economies are marked by strong industry co-ordination (Dedrick and Kraemer, 1995, p32).

Some research suggests a country's capacity for sustained technological innovation is crucial to it's economic well-being, and government support is thus essential. Critics counter that any effort by government to pick winners, or otherwise unilaterally control technological outcomes within its own borders is certainly doomed - the cure is worse than the disease (Branscomb, 1992, p24).

Market-directed strategies are based on the idea that the operation of the free market will lead to optimal resource allocation and result in the most desirable economic outcomes. The government treats the market as an end in itself (Dedrick and Kraemer, 1995, p32). The government concentrates on ensuring the smooth operation of capital, labour, and product markets.

The table in 2.6 compares 6 countries using this approach.

2.8.2 Ein-Dor et al

In an attempt to explain the IT success of three small countries, Ein-Dor et al considered seven groups of variables (Ein-dor et al, 1994, pp3-4):

- Control variables - those which define country size and general economic development (population, GDP per capita)
- Dependent variables - those which define IT success such as IT production development measures (IT product sales, contribution to GDP, percent of firms in IT production, percent of employees in IT production) and IT industry success measures (locally developed IT products, IT industry exports)
- Exogenous mediating factors such as geographical location, raw materials and culture
- Domestic IT use measured by factors such as IT spending relative to GDP, number of computers installed and use of telecommunications
- Firm strategies, for example market and product selection strategy, global presence strategy, and labour cost strategy
- Government policies as they relate to IT, e.g. degree of active encouragement, R&D support, priority attached to IT development
- Government education policies such as general education levels, and Computer Science education.

The last four variables are most readily controlled or influenced by firms or government and are referred to as endogenous mediating factors. Exogenous factors are those over

which little or no control is possible at any level (such as geography, culture) and which must be accepted as given. (Ein-dor et al, 1994, p3)

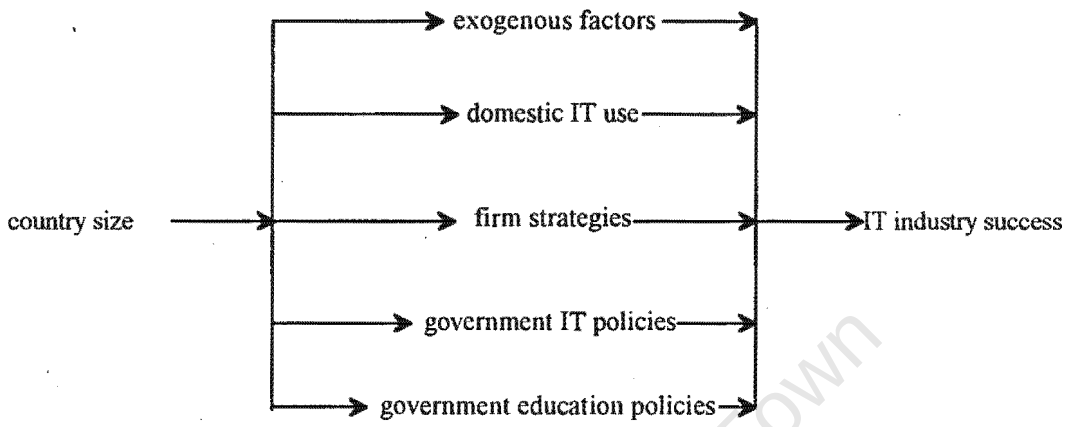


Fig 1: Factors affecting IT industry success

Graphically this model may be represented as above (Ein-dor et al, 1994,p3)

Ein-dor et al (1994, p4) caution that it is impossible to describe all the variables with the same degree of rigor.

2.8.3 Kraemer and Dedrick

Kraemer and Dedrick (1993a, p366) developed an analytical framework for an international comparative study of the globalisation of the IT industry in 1991. The analysis is divided into three parts: environment, technology policy, and IT diffusion. The framework analyses the effects of government policy on the production and use of IT using a historical and quantitative approach. The framework assumes that environmental factors constitute independent variables that affect technology diffusion either directly or

indirectly through the mediation of policy. In the figure the bold straight lines represent direct, immediate effects, and the thin curved lines refer to feedback effects .

The section on Environment looks at the broad environment in which the IT sector operates. It analyses:

- The political, economic, and social factors which may affect IT development
- The country's position in the world economy
- The will of it's people to adapt to new technology
- The state of entrepreneurs in the country
- Political stability
- The nature of macro- and micro-economic policies
- The IT infrastructure, which includes the human resources, finance, technology and capital necessary to produce and use IT
- R&D capabilities
- The telecommunications network
- Education system
- Banking system
- General industrial capacity (Kraemer and Dedrick, 1993b, p4)

The section on IT Policy analyses government policies toward the production and use of IT. Policies such as trade and foreign investment policies, government procurement policies, human resource development policies, import and export policies, incentive and

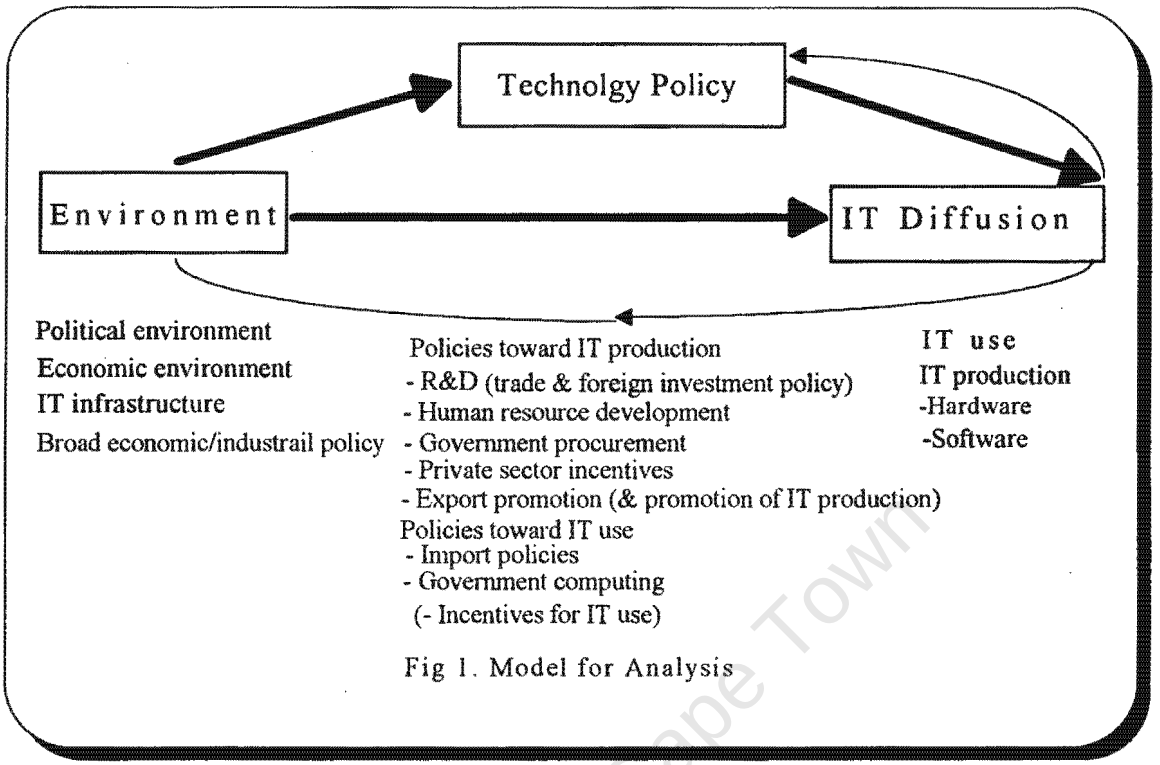


Fig 1. Model for Analysis

restrictive policies, are examined. In fact all policies and regulations in a country which influence IT (Kraemer and Dedrick, 1993b, p4-5).

The section on IT diffusion looks at the history of IT production and use and what effect the actions of the government have had on IT diffusion (Kraemer and Dedrick, 1993b, p4)

2.8.4 Miller

Although Miller (1994a, p10) does not have a defined framework, he advocates three steps to determine what an ITP should emphasise. The first step is to gain an understanding of the key features of South Africa as a nation. Step two is to examine it's IT endowments and finally step three is to look at the relevance of recent political and economic developments in the country.

In step one Miller (1994a, p10) looks at South Africa's political past, competitiveness rating, wealth distribution, access to IT.

Step two, the section on IT endowments firstly covers the electronics industry which looks at teledensity, manufacturing and innovation. The country's IT infrastructure is covered next. Here, expenditure on IT, industry organisation, penetration and effectiveness of IT, IT in the public sector, and policies and procedures pertaining to IT, are examined. Next the offerings of private training establishments, technicons and universities are examined (Miller, 1994a, pp10-13).

In the third step Miller (1994a, pp13-15) looks at political and economic developments in South Africa. The RDP is examined for what it says and does not say about IT.

2.8.5 Munasinghe

Munasinghe (1995, p481) states that DCs need to look at a mixture of top-down (government - plan directed) and bottom-up (industry - market directed) approaches when developing an ITP.

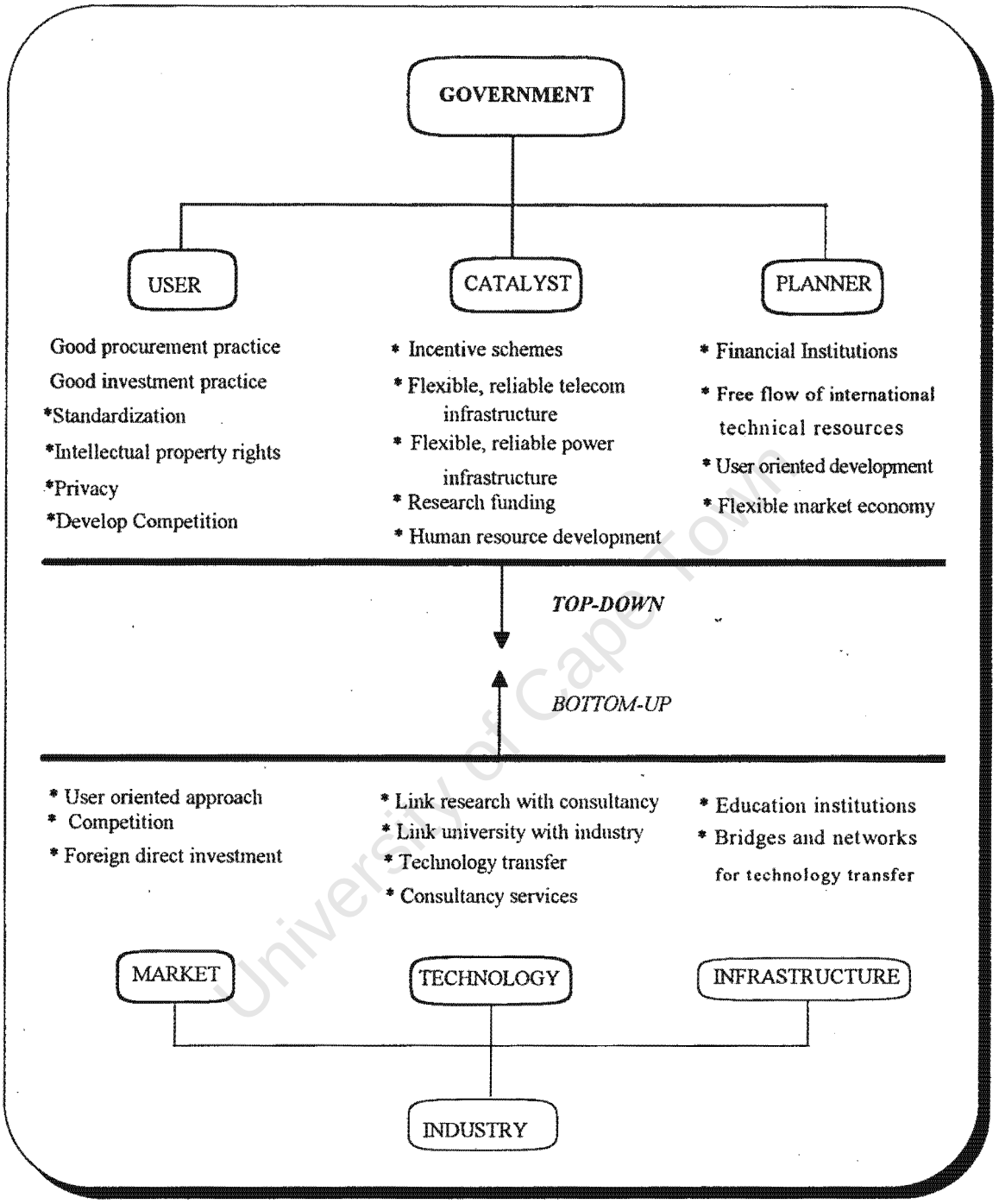
He (Munasinghe, 1995, p482) believes that government support is crucial for increasing access to IT, technology transfer, and education and training. Top-down approaches should focus on the widespread and effective use of the appropriate technology. The government has three roles in an ITP - user, catalyst and planner.

As **users**, governments can eliminate or reduce irritating reporting, improve poor information recording, create information-sharing policies, and improve the sometimes slow and costly transaction systems. These actions will improve the efficiency of the economy (Munasinghe, 1995, p482).

Munasinghe (1995, p482) believes the government's role as **a catalyst** should be the most important and dominating of it's roles. The reliability and flexibility of the telecommunications and power infrastructures are the key to success in the application of IT. The government can initiate incentive schemes and development programmes for small and medium-sized enterprises, and upgrade educational, training and R&D institutes.

As **planners**, governments need to ensure that the private sector can operate properly, that international technical resources are allowed to flow relatively freely, and that the country's financial institutions are sound and competent (Munasinghe, 1995, p482).

The bottom-up or flexible market-economy approach attracts more firms and foreign direct investment into the industry, thereby increasing competition. Market size can be expanded by the user-oriented approach of subsidised training, consultancy assistance and the development of educational institutions. Foreign direct investment and IT subcontracting will ensure technology transfer. These measures will also enhance network capabilities and bring in capital. Technology development, from which productivity increases, efficiency, and service quality flow, can also be achieved by



linking industry with universities, and the consultancy services sector with research institutions (Munasinghe, 1995, p482).

2.8.6 Summary

The plan versus market analysis is good for examining IT production, and is not wide enough for this report. Munasinghe's framework looks at the role of government and industry in developing an ITP. Ein-Dor et al, Kraemer and Dedrick, and Miller's frameworks look at comparing ITPs, and are similar in nature. They can be grouped into three sections - environment, policies and impact on IT.

All have a section (s) examining the country's environment. Ein-Dor et al split this between 'control variables' and 'exogenous factors', Kraemer and Dedrick use the term 'environment', and Miller uses the term 'key features of the nation'.

The next section examines the policies of the country. Ein-Dor et al use 3 variables - firm strategies, government IT policies, and government education policies. Kraemer and Dedrick group these under the heading 'Technology Policy' in which they examine government and private sector policies. Miller calls this 'political and economic developments' in which he examines government policies.

The final section deals with the impact on IT. Ein-Dor et al use two variables, 'domestic IT use' and 'IT industry'. Kraemer and Dedrick call this 'IT Diffusion', and Miller refers to it as 'IT endowments'.

This dissertation will use Kraemer and Dedrick's model to compare South Africa to other countries, but will draw on Ein-Dor et al and Miller's models in the process.

CHAPTER THREE THE RESEARCH APPROACH

"Traditional scientific method has always been at the very best 20-20 hindsight. It's good for seeing where you've been. It's good for testing the truth of what you think you know, but it can't tell you where you ought to go", Robert M Pirsig (b. 1928)

3.1 INTRODUCTION

Literature on IT Policies plus data on various countries has been collected and compared. Based on this comparison, a National IT Policy framework was developed for South Africa. Given the limited research that has been done on National IT Policies in South Africa, a direct research approach involving an opinion survey was adopted to verify the framework.

3.2 RESEARCH METHOD

This research comprised ten distinct phases building towards the complete material upon which the recommendations are based.

1. The first phase of the research consisted of a literature search of published and unpublished documents, reports, papers, and statistics on National IT Policies and IT production and use in several countries, aiming to establish what other governments are doing with regard to IT policies, and what the effects their actions are having.

2. The second phase consisted of finding a framework to compare the data and IT Policies from the different countries. Several frameworks were examined, and one developed by Kraemer and Dedrick (1993a, p336) was selected.

3. The next phase involved selecting countries to compare South Africa to. Countries were chosen for various reasons. Singapore was chosen for their success with IT Policies. New Zealand for their success without an IT Policy. Chile, Brazil and India were chosen for their protectionist IT Policies designed to grow their IT industries. Chile was selected for its open policy. Australia was chosen as it recently debated the question of whether it should have an IT policy or not.

4. Phase four involved gathering data from the countries to fill the model. The data came from sources such as official government publications and reports, industry surveys and reports, internet, and newspaper and magazine articles.

5. Phase five consisted of comparing the data, and searching for trends, results, gaps, and effects. Each country's technology policies and diffusion of IT were examined in the context of the country's broader economic and political environments.

6. The next phase was to develop the outline of an ITP for South Africa using the results of the comparison. This outline then had to be verified in some way.

7. Phase seven involved a questionnaire to test opinion on an ITP. The author contacted Jason Dedrick and Michael Myers who had independently interviewed people for their research, and both said that they had no instrument. As no suitable instrument was found, a questionnaire was designed to assess opinion regarding a national IT policy for South Africa. The questionnaire was then tested on a small sample of individuals.

8. Phase eight involved selecting opinion makers to complete the questionnaire. A group of 72 opinion makers both in South Africa and internationally were contacted and asked to complete the questionnaire. Of these 60 (83%) said that they would be willing to answer the questionnaire. These 60 consisted of 11 academics (6 from South Africa, and one each from New Zealand, Denmark, US, Kenya, Romania), 26 government employees (23 from South Africa - Director Generals from most government departments, one each from Australia, New Zealand and Singapore), 14 business people (from the following sectors of South African business - retail, banking, insurance, publishing, black entrepreneurial), 2 IT vendors one of which was from the UK, one South African politician, the CSSA president, an ITUC director, one from IDRC, one from the World Bank, and an IT journalist. A 38% response was received.

9. In phase nine the questionnaires were analysed, and compared to literature search and the policy outline developed in phase six.

10. The final phase consisted of redrafting the policy outline produced, to incorporate the opinions gathered.

3.3 RESEARCH INSTRUMENTS

Two research instruments were used, the framework developed by Kraemer and Dedrick (1993a, p336) and the questionnaire.

The Kraemer and Dedrick framework has been widely used and documented by the authors in various papers. The framework analyses the effects of government policy on IT using a historical and quantitative approach. The model it was also used by Vietnam in drawing up its ITP (Vietnam, 1993).

A method was needed to seek support for the propositions. As the propositions cannot be proved by facts or figures in the time span of this research, it was decided to prove by inference, by seeking the views of opinion makers. Furthermore, the research is interested in what South Africa really needs in terms of IT. It was felt that the best way to gather this was by a survey of expert opinion. The opinions are what is important, as there are no facts.

A questionnaire was developed using Hunt's (1995) guidelines to evaluate the opinions of selected individuals as to the appropriateness of the proposed/recommended IT policy for South Africa. The questionnaire was tested on five individuals, and modified according to their input.

This modified questionnaire (Appendix A) consisted of a mixture of open and closed questions. It was used in an opinion survey posted to individuals. The first part of the

questionnaire (questions 1-5) asks whether South Africa should develop an IT Policy, and whether it would help the country achieve competitive advantage. The remaining questions sought opinions on specific policy issues.

3.4 LIMITATIONS

In the literature search, it was not possible to describe all the variables with the same degree of rigor, so they are described for each country on the basis of data available. However, an attempt was made to be as consistent as possible with all the variables. It was virtually impossible to find all the data for a given date. As a result, data in the paper are dated from 1991 to 1994.

All monetary data was converted to US dollars for ease of comparison, as was done by the model builders. This may induce some errors as all such conversions involve averaging, and a choice between multiple exchange rates. However the convenience of a single currency clearly outweighs any loss of accuracy involved.

The limitations of the questionnaire are that the quality of the information obtained is proportional to the respondents' co-operation, interest and knowledge. The number of responses from South African government ministries was less than 35%.

This is a rapidly changing field. New information is coming out all the time.

3.5 RESEARCH PROCEDURE

The procedure for the opinion survey was as follows:

- Individuals were telephoned or contacted by electronic mail (e-mail) and asked if they would be willing to participate. Some of the individuals insisted on discussing a broad overview of the study prior to agreement
- All individuals who agreed to participate, where offered a choice of how to receive the questionnaire - by post, fax, or e-mail
- The questionnaires were then sent to the individuals, asking them to respond within 14 days
- No attempts were made to explain the details of each question in order to obtain the greatest possible objectivity
- Completed questionnaires were returned by e-mail, fax or post.

CHAPTER FOUR RESEARCH FINDINGS

"If computer policies have any effect, it is likely to be more qualitative than quantitative and more long term than immediate" (Kraemer et al, 1992, p155)

4.1 INTRODUCTION

Kraemer and Dedrick's model will be used as a basis to examine the IT situation in South Africa, as it has been widely used to examine other countries' IT situations. South Africa will then be compared to several other countries looking for trends, results, gaps, reasons, explanations and effects. The results of the opinion survey will then be presented and discussed.

4.2 EXISTING SITUATION IN SOUTH AFRICA

"Democracy will have little content, and indeed, will be short lived if we cannot address our socio-economic problems within an expanding and growing economy", Nelson Mandela (RDP, 1994)

The South African environment needs to be understood firstly, then the policies that have implications for IT use and production, and finally the results in terms of IT diffusion in South Africa. This will assist us in answering the questions: Should South Africa have an ITP, and if so, what should it emphasise?

4.2.1 Environment

Very little can be done to change geographical and environmental conditions, and they must be accepted for what they are. South Africa is situated on the southern point of Africa. She is a regional superpower, as her smaller and poorer neighbours are heavily dependent on her goods and her roads, railway lines and harbours says Woodward (1988, p23). For these reasons she can be considered the gateway to Africa.

South Africa is one of the drier countries with an average rainfall of 464mm, compared with a global average of 857mm (Woodward, 1988, p18). The Country is one of the world's leading producers of metals and minerals. South Africa mines more than 50 metals and minerals, the most important being gold, diamonds, uranium, coal, and platinum. Her biggest source of revenue is gold which accounted for 28% of total exports in 1992 (Ryan, 1994, p24).

South Africa does not have a uniform or easily definable culture. The country has eleven official languages to cater for her multi-cultured society. Possibly as a result of geography and political sanctions a pioneer culture of innovation and going it alone exists in the country.

The environment section of Kraemer and Dedrick's framework uses similar factors to the World Competitiveness Report to look at countries. 'Political Environment' is similar to 'Government', 'Economic Environment' includes 'Domestic Economic Strength', 'Internationalisation' and 'Finance', 'IT Infrastructure' is included in 'Infrastructure',

'Human Resources' includes 'People' and 'Management', and 'Science, Technology, and R&D Infrastructure' is included in 'Science and Technology'.

4.2.1.1 Political Environment

South Africa has just come out of 40 years of political isolation, of world-wide condemnation for its unjust political policies. The first form of sanctions against South Africa was imposed by President Kennedy in 1960 (Wood, 1993, p8). South Africa had one of the worst governments in the world, with one of the worst policies, the 'apartheid' policy.

The policy of 'apartheid' crossed all sectors of life in South Africa. Its people were divided by race groups, and by ethnic groups within races. People were not allowed by law to live where they wished, to marry whoever they wished, to worship where they chose, to play sport with whom they liked. They were forbidden to use any public amenity, or any public transport, beach, or to watch any movie or play. People were not educated equally, or allowed to compete equally for jobs, to have a voice in their fate, to be hospitalised at any hospital, to receive blood from a person of a different racial classification in a blood transfusion. People in South Africa were even buried according to their race. Resources were distributed unevenly. Infrastructure was developed in certain areas and not in others. People were prosecuted for not carrying their 'pass' documents which stated where they were allowed to be.

The Group Areas Act (1950) demarcated separate residential areas in towns and cities for specified racial groups. Disqualified persons were evicted from those areas. It was finally scrapped in 1991. The Immorality Act (1927) forbade extra-marital intercourse between whites and blacks. It was scrapped in 1985. The Prohibition of Mixed Marriages Act (1949) which outlawed marriage between whites and non-whites, was also scrapped in 1985. The Industrial Conciliation Act (1956) provided for specific types of work to be reserved for persons of a specified race group. The Reservation of Separate Amenities Act (1953) legalised the reservation of toilets, beaches, park benches, lifts, parks, public transport, subways, entrances to buildings, post office counters and other public premises or vehicles for use only by a particular race or races. This act was scrapped in 1990. The Population Registration Act (1950) brought in a system of racial classification based on appearance, general acceptance and repute, only scrapped in 1991.

The South African Armed Forces were segregated and spent many years 'fighting' our citizens both internally and externally. The South African Police were involved in combating 'communism' and other 'onslaughts' against the government, the most widely remembered of which was the Sharpeville shootings in 1960 in which 76 protesters were shot dead. The overall result was a deeply divided, fearful and suspicious society.

The reform process began to gather momentum in the early 1980's, and the 'pass laws' and Mixed Marriages Act were abolished. In 1994 South African citizens were treated to their first democratic elections. The current government has enormous challenges of

righting the wrongs of the past, uplifting the people, growing the economy, and building the country's infrastructure.

In 1994 South Africa had the highest crime rate in the world, and millions of her citizens still lived in poverty and ignorance. Preventable diseases are still killing thousands according to Heydenrych (1994, p5). The number of homeless increase as illegal aliens stream across her borders. Unemployment has never been higher, and white collar fraud continues to ravage what is left of the economy.

Harfoush and Wild (1994, p13) says that there are some features that will help South Africa meet these challenges. The spirit of dialogue and consensus building has brought people from different sides of society together to consider many issues for a common purpose. This spirit bodes well for agreement on many issues. Heydenrych (1994, p6) adds that isolation made South Africa innovative, particularly in IT. South Africa needs to use this strength to create and innovate to build the country up rather than to simply survive.

The 1995 World Competitiveness Report (WCR, 1995, p227) ranks South Africa's government (this factor describes the extent to which government policies are conducive to competitiveness) 38th of the 48 countries surveyed . Criteria used to measure government include government consumption and employment, tax rates, foreign debt, official reserves (WCR, 1994, p34). South Africa's huge foreign debt drags her down.

4.2.1.2 Economic Environment.

South Africa's per capita income of US$3158 in 1994 classifies it as an "upper-middle-class developing nation" says to Miller (1994a, p6). According to the WCR (1995, p277), South Africa has dropped to 42nd out of the 48 nations surveyed in overall global competitiveness. Furthermore South Africa's domestic economic strength (ranked 42nd), and internationalisation (the extent to which South Africa participates in international trade and investment flows) (ranked 43rd) have dropped in the past year, and are all relatively poor in comparison to other countries in the report. The 1995 report ranks South Africa 20th (one place up from 1994) in terms of finance (performance of capital markets and the quality of financial services).

For most of the 20th century whites, who constituted 20% of the population, earned about 70 % of total income. The poorest blacks are getting poorer while a black upper class is emerging. By 1991 Blacks were earning nearly 28% of national income, the whites share had dropped to 61% (Miller, 1994a, p6).

South Africa's electronics and technology sector is very well developed for a developing country. South Africa has the capacity according to Harfoush and Wild (1994, p13), particularly in the parastatal sectors, for managing large scale complex projects that are required to implement an information management system that spans sectorial boundaries, and encompasses all levels of government and reaches out to the general public.

According to Smith (1996, p29) Minister Jay Naidoo has said that the government lacks a map of investment concentrations, or even which locations may be best for electronics manufacturing. This fact necessitates a strategic planning framework, which requires accurate information, and this makes the October 1996 national census crucial for an information baseline.

4.2.1.3 Public Sector Reforms

"We need to get a more user friendly, customer oriented, civil service" says Minister Naidoo (Smith, 1996, p30).

The country was previously split into four provinces, each with several departments of health, education etc. for each population group. There were also four 'independent' states of Transkei, Bophuthatswana, Venda and Ciskei, as well as the five 'self-governing' territories KwaZulu, Gazankulu, KaNgwane, KwaNdebele and Qwaqwa. Each of these 'states' had their own public sectors. The government elected in 1994, has reincorporated the nine 'states' into South Africa, and split South Africa into 9 provinces under a federal system. Approximately 800 segregated local authorities need to be grouped into approximately 300 new local authorities (ANC, 1994, p 129).

What is known about the use of IT in government sectors according to Miller (1994a, p12) suggests fragmented and archaic policies and procedures exist in areas such as health, education, policing and public administration (Skweyiya, 1994, p67). There is little evidence of effective exploitation of IT in public education.

The health system in South Africa is extremely fragmented, both by race and by type of service reports Braa and Heywood (1995, p2). There are often multiple health authorities with little or no co-ordination or co-operation in one area (Braa and Power, 1995, p135). Health information services have suffered the same fate, and are fragmented and unco-ordinated. Cape Town has four health systems and therefore four different health information systems.

Several public service departments such as the Police and Health, are known to be looking at developing new systems. The following extracts come from the March 1996 issue of IT Review: Central Computer Services(CCS) recently installed new storage systems (p53); Anderson Consulting is currently working within government on the streamlining of business processes (p47); Mpumalanga Province has developed a Master Systems Plan to determine its provincial and departmental IT needs for the next 5 years (p50); Mpumalanga Province has implemented Compuware Corporation's Uniface client server development environment (p50); South African Reserve bank announces plans to overhaul the national payment system (p11) and The Department of Agriculture takes a US$400000 system from NDS (p11).

The problem is that they are all acting in isolation with little consultation between them. This will result in duplication and redundancy, as well as applications which do not interface easily.

In late 1994, the RDP office began a National Information Project to establish a base for sharing of information between departments and provinces, this project was stopped while waiting for clearance from the State Tender Board (Smith, 1996, p29). Smith adds that the civil service cannot tell how many people it employs, as there are no links between departments to establish this and other facts.

Some of the principles and objectives in the RDP refer to freedom of information, access to information, protection of privacy, transparency and accountability of government, and ownership of information. These issues require legislation to provide a suitable framework for them to be implemented into society. There is a need for a study comparing legislation of different nations on these issues urges Harfoush and Wild, 1994, p32).

4.2.1.4 Outcomes of Economic Reforms

The reform program South Africa has undergone since 2 February 1990 has changed many aspects of life in the country. The ban on new investments was lifted by the European community in April 1991, and in July 1991 the USA lifted most sanctions including sales of IT except to the military and police (Wood, 1993, p26).

There has been a return of many MNCs such as IBM, Apple and Coca-Cola. The indices on the local stock market have continued to rise, and the inflation rate dropped to 9% for 1994 (WCR, 1995, p376).

However, South Africa still has a huge national debt standing at 50% of GDP according to Business Africa (April 1-15 1995, p2), unemployment has remained at 48% over the past two years (WCR, 1995, p718), and GDP per capita has declined from US$3 885 in 1992 (WCR, 1994, p237) to US$3 158 in 1994 (WCR, 1995, p364).

In spite of this, the ANC increased their percentage of the votes in the local government elections held in late 1995. However it remains to be seen how much longer the people will wait for the government to revitalise the economy so that they can see the benefits in growth and jobs.

4.2.1.5 IT Infrastructure

IT in South Africa is the most advanced on the African continent. "World-class indigenous computing capabilities exist in several areas such as banking, the military, and mining" according to Goodman (1994, p21). But South Africa's first world economy and its embedded IT community, serve only about 25% of her people.

Years of economic sanctions against South Africa left a gaping hole in the IT market says Clarke K (1994, p40). However South Africa represents about 1% of world market in IT, so it's a sizeable player. Estimates on the size of the IT market vary between US$1,3 billion and US$2,1 billion pa. An estimated one million PCs had been sold in South Africa by the end of 1992, and the number is expected to be close to two million by the end of 1996 (Clarke K, 1994, p42).

In the early 1990's South Africa was 22nd in the world as a consumer of electronic products, and the 9th largest importer according to Miller (Miller, 1994a,11). There is a heavy reliance on imports in the electronic sector. However, there is evidence of innovation, including the world's first true cellular pay phone. South Africa has no developed computer manufacturing industry. The overall teledensity is low, and there is a great imbalance in the provision of telephones (Miller, 1994a, p11).

The Computer Society of South Africa estimates that there are about 50 000 so-called IT professionals in South Africa.

South Africa's strengths in the IT arena are summarised by Miller (1994a, p15) as an entrepreneurial spirit, a record of IT innovations. A relatively well developed financial services sector, strong links with MNCs, active professional bodies, and a national telecommunications forum. Her weaknesses according to Miller are the fragmented policy initiatives, poor management of public data, racial inequalities in IT, inadequate IT facilities at all educational levels, and attitudes towards intellectual property rights.

Several authors including Moikangoa et al (1995, p7) and Miller (1994a, p15) agree that South Africa needs to conduct a full scale assessment of her IT endowment and capabilities.

4.2.1.6 Human Resources

The 1995 World Competitiveness Report (1995, p738) gives South Africa a Human Development Index of 0.65, lower than that of Brazil and Turkey. Estimates of the percentage of South Africa's adult population which are illiterate varies from 22% (WCR, 1995, p726) to over 50% (Grobler, 1995, p27). Gross domestic savings as a percentage of GDP was 17,5% for 1993 (WCR, 1995, p374), compared to 28,75% for Chile and 22% for India.

The 1995 Report ranks South Africa's people (availability and qualifications of human resources) last of the 48 countries surveyed (WCR, 1995, p227). This is measured using elements such as basic education (expenditure on education, enrolment figures and pupil-teacher ratios), competitive education profile (level of compulsory education, companies investment in education and training, economic and computer literacy), and values of society (worker motivation, attitude to life) (WCR, 1994, p44). The same report ranks management (extent to which enterprises are managed in innovative, profitable and responsible manner) 35th (WCR, 1995, p277). Key social indicators such as life expectancy, infant mortality and adult illiteracy are not very different from those in low income sub-Saharan countries says Minister Naidoo (1996, p24).

The general education levels are racially imbalanced and unknown. Smith (1996, p29) tried unsuccessfully for more than two months in 1996 to get the various education departments in South Africa to reveal the numbers of children enrolled at pre-school, primary and secondary school levels, and how many schools there are in South Africa.

4.1.2.8 Telecommunications

The demand for telephones has been unsatisfied almost throughout the period 1981 to 1990; the teledensity is lower than what could be expected on the basis of GDP per capita according to Koning and Blees (1994, pp133-143). Teledensity varies between 30 lines per 100 people in Pietermaritzburg to less than 10 in Vereeniging. Differences in the provision of telephone services to the different ethnic groups also varies. The average level of penetration in white households is 77%, but for black households it ranges from 2% to 28% (Kelly, 1994, pp125-132). The government is convinced that a state monopoly is the most efficient way to address South Africa's low penetration, forgetting that it was a state monopoly that caused the problem says Bidoli and Laing (1995, p27).

The 1995 WCR (WCR, 1995, p227) ranks South Africa's infrastructure (extent to which resources and systems including telecommunications are adequate to serve basic business needs) 19th of the 48 countries surveyed.

The value and size of the South African telecommunications sector is not easily quantifiable according to the Telecommunications Green Paper (1996). The Green Paper did however provide the following statistics: Telkom's turnover for the 1993-4 operating year was over US$2 billion, and it employed 60 000 people. Telkom provided 3,66 million main telephone services, 60% of which were digital, and 50 000 public telephones. Telkom has a sizeable interest in the INTELSAT global satellite system, valued at over US$23 million, and in the submarine cable SAT-2. Telkom also has a 50% interest in the cellular company, Vodacom. There are two other major network providers

in South Africa, the cellular companies, Vodacom and MTN, with a combined customer base of over 300 000.

South Africa's recent network growth has been modest at around 7% over the past decade, barely sufficient to keep up with the population growth. One of underlying reasons according to Kelly (1994, pp125-132) is Telkom's high level of debt. Telkom has been spending as much as a quarter of it's revenue on interest payments. Reasons for the debt include the relatively high cost per line added due to the geography of South Africa, and sanctions increased the cost of equipment.

According to Bidoli and Laing (1995, p27) policy decisions will have a crucial impact on whether effective competition develops in telecommunications in South Africa in the future. The global trend is towards commercialising and privatisation (Koning and Blees, 1994, pp133-143).

4.2.2 Information Technology Policy

South Africa has no formal ITP. The South African government policy in the 1970s, 1980s and early 1990s included certain barriers to IT use. The reason was not to protect the South African IT industry, which was almost non-existent. There was more concern over trade deficits and currency control.

After coming to power in 1994, the new government has removed import permit requirements on new hardware and software, and removed the surcharge.

There is no duty payable on the intellectual value of software imported into South Africa. Value Added Tax (VAT) of 14% is payable on the non-intellectual portion of software imports. Hardware attracts an excise duty of 6% (calculated on customs value plus 15%), and VAT of 14% (calculated on customs value plus 10%, plus excise duty). Due to the method of calculating these figures, the actual rates are 6,9% excise duty, and 16,37% VAT.

4.2.2.1 Policies Toward IT Production

R&D Initiatives. The government has played a limited role in IT R&D mainly through the Council for Scientific and Industrial Research (CSIR). The CSIR was created to co-operate with technologically sophisticated partners says Mullin et al (1992, pp30-31). However, the CSIR has started to focus on the technology needs of small enterprises over the last few years, and now competes with the private sector.

The Foundation for Research Development (FRD) was founded in 1990, and supports research and training of researchers in the tertiary education system in science, engineering and technology (Mullin et al, 1992, p35), (Wood, 1993, p20).

Miller et al (1996) state that the decline in R&D spending over the last few years represents a serious national concern. The Green Paper on Science and Technology (S&T Green Paper, 1996, Section 1.1) acknowledges that there has been a tendency to reduce R&D spending for the past seven years. It was at 1,04% of GDP in 1987. The

OECD (OECD, 1992, p42) states that R&D expenditures less than 1% suggest a weak national system of innovation.

Regional Development. A Technopark was created 50 km from Cape Town in 1986 by the Stellenbosch Municipality. The municipality's aim was to launch a project which was not detrimental to the environment, and which would strengthen it's character as an academic town. This technology park was developed as a site where high-tech companies could locate and interact with each other, as well as local academic and research institutions. The local universities have no financial involvement, but have seats on the park's advisory committee. Currently the park hosts 40 companies.

Malan (1996), the director of the park, stated that the following factors constrain the development of the park:

- Lack of a national culture of R&D
- No nationally driven R&D plan
- No competitive incentives for foreign companies to relocate to South Africa
- No tax breaks for research
- Lack of finance for venture capital.

A second Technopark, called Hitech Park, opened near Pretoria, but Malan (1996) states that it is more of an office park, with very little research happening. Malan feels that the proposed park for Muizenburg will develop into a high-tech industry park with little, if any, research.

Human Resource Development.

Education is widely regarded as the basis for all human resource development. Given the huge educational backlogs in South Africa, computer-based education as an alternative method of improving the existing educational situation should be examined according to Grobler (1995, pp26-35).

Bornman (1995, p31) says IT is occasionally offered as an optional subject at schools, but there is no set curriculum. South Africa currently has children in their final school year, and pre-final year with no IT exposure at all, nor the prospect of getting any exposure before they leave school.

The number of computer science degrees produced has not changed much over the past three years. In 1994, 695 Computer Science and 489 Information Systems degrees were awarded in South Africa says Bishop (1995, p5). A worrying factor is that, according to Bishop (1995, p9) South African universities are employing more under-qualified teaching staff and having them complete their studies on the job. Bishop (1995, p9) concludes that South Africa has lost many PhD's to emigration in the past three years. This in line with the WCR ranking on South Africa's 'brain drain' (WCR, 1994, p592).

Computer literacy among South Africa's employees is ranked 46th out of a possible 48 by the WCR (1995, p729).

An Information Technology National Qualifications Framework (ITNQF), was established in 1994 to focus on skills required by the IT industry, and to develop IT practitioners. The ITNQF aims to develop strategies which cover IT training at schools, learning facilities for IT, common standards for education and training and IT career development (Benjamin, 1996).

Export Support. The Department of Trade and Industry's (DTI) Support Programme for Industrial Incentives has an incentive scheme available to manufacturers. The DTI will assist with market research, as well as financial assistance for marketing a product, and attending trade fairs. The DTI's export incentive scheme can repay 50% of airfares, as well as a daily allowance.

Government Procurement. There is no centralised government procurement policy, nor a buy South African policy. Previously several government departments such as Defence had covert procurement policies as the open market was closed to them because of sanctions. Telkom entered into restrictive purchasing agreements during the sanctions years with certain vendors, which resulted in Telkom paying a premium for equipment.

Review of IT Production Capabilities. South Africa is one of 23 countries capable of manufacturing silicon wafers according to Dr. Ngubane (Hartley, 1996, p19). There is very limited IT production in South Africa. Netsys International manufactures and exports a communications network product and weather switch.

Lack of venture capital is a problem. Entrepreneurs have to rely on their own financial resources to start businesses. Malan (1996) says there is no cheap capital available to entrepreneurs, and sites this as the main reason why there have been some failures at the Technopark.

The government offers no tax breaks for R&D, or accelerated depreciation for IT investments. Software purchases have to be written off in the year the software becomes operative. This adds to the effective cost of software purchases. Developers can write off development costs over the theoretical life-span of the product.

Industry Co-ordination. There has been no real effort at Industry co-ordination in South Africa.

4.2.2.2 Policies Toward IT Use

Private Sector Computing. Wood (1993, p24) says sanctions inflated IT costs in South Africa, decreased overall productivity gains, speeded up purchase decisions, and caused companies to purchase IT earlier than needed. The result was that companies were stuck with expensive, often obsolete IT equipment.

The financial services sector in South Africa has invested heavily in IT, and all commercial banks have their branches on-line. One can find an automatic teller machine in most towns in South Africa.

Almost all South African companies select imported IT products. There are a few local niche products. During the sanctions years when many MNCs withdrew from South Africa, many South African companies were created with links to the MNC. Most of the MNCs have returned and repurchased the South African company. IBM, for example, repurchased ISM the company created when IBM pulled out of South Africa. A few South African firms have alliances with MNCs - Hi-Performance Systems has an alliance with Hewlett-Packard.

Government computing. Government departments have separate independent IS departments. There is no co-ordination, integration, standardisation, or central IT planning.

The South African government has made no effort to promote IT use in the private sector. It offers no incentives to encourage IT investment, and makes no efforts to create public awareness of IT.

South African government spending on IT is traditionally worth about one third of South Africa's total IT purchases. According to Sergeant (1995, p24) some sources believe that at least 40% of government IT systems will be revamped to fall in line with government's aims and objectives. The emphasis is expected to be on ensuring delivery from the RDP prior to the next elections in 1999.

4.2.3 IT Diffusion

4.2.3.1 IT Production

Hardware. Very little hardware is actually produced in South Africa. A few items such as PCs are locally assembled. A government requirement that telecommunications switching equipment had to contain a minimum of 40% local value added content will fall away in June 1996. In 1994 the South African government signed the GATT agreement agreeing to phase out all trade barriers within two years.

Miller (1994a, p11) suggests South Africa spent R2,5bn on hardware and R4bn on software in 1993, a total of R6,5 bn (approximately US$1,7bn). Estimates of South Africa's annual expenditure on IT vary from US$1,6bn (Wood, 1993, p4) to US$1,8bn (Miller, 1994a, p11) to US$3,5bn (Sergeant, 1995, p24). These are all estimates as no-one really knows. An amount of US$1,6bn would make South Africa the worlds 19th largest computer market according to Wood (1993, p4). Growth in yearly sales of IT has been 10-15% p.a. since 1988 according to Wood (1993, p17).

Some examples of hardware production are (Wood, 1993, p51&52):

- MLA Power builds uninterruptable power systems that are highly reliable in harsh environmental situations such as thunderstorms
- QED has developed a relatively fast (8 minute per page) multicolour inkjet drum printer
- Compu-Power produces an all-mental shock and vibration resistant PC case.

- Altech offers a low price small-business telephone system that includes intercom, call intercept and transfer, conference calls and speed dialling.

Software. Software production is growing and being exported. Some examples of locally developed software products are (Bakker, 1994, p89):

- Ghostwriter, a word processing package
- Jutastat, a legal reference package
- Q-Pac, a payroll system
- ReGIS, a geographical information system
- Exsol and Complete two workflow packages
- Peresoft a cashbook
- AccPac an accounting package
- FlexGen a fourth-generation language
- Genesis a graphics design program
- AllyCAD a computer aided design package.

Several of the above are exported. ReGIS, Peresoft and FlexGen have made some significant overseas sales. FlexGen, for example, has over 7000 sites in the US according to Bakker (1994, p89).

Smith (1995, pp26-27) sounds a note of caution, South African system development companies tend to overrun budgets by about 25%. This is not good enough if we want to compete internationally. Mean time to failure of South African developed software is

higher than average. In addition, research has shown that South African companies go for larger, harder-to-manage projects.

Services. There are a large number of IT service companies operating in the country, some of whom also operate in bordering countries. Several international service companies such as EDS, Gartner, Meta and Andersen Consulting also operate in South Africa.

4.2.3.2 IT Use

IT was first used in South Africa in 1957. The first computer to arrive in the country was a Hollerith HEC4. The CSSA was founded in the same year according to Wood (1993, p16). Today the banking and insurance sectors are the heaviest users of IT.

Miller (1994a, p11) estimated that over 1,2 million PCs are currently in use in South Africa. Telkom boasts an average of 8.9 telephones per 100 people (Song and Akhtar, 1995, p57). In 1990 there were 3,080,333 phone lines (5,017,268 telephones) representing an investment of US$3.6 million (Wood, 1993, p47).

Boon et al (1993, pp 118-121) estimated that the information sector contributed an average of 5,45% of the total GDP over the years 1978-1988. The percentage of information workers was estimated to average 5,7 % of all workers for the same period. The percentage of information workers was similar to the percentage contribution the

information sector made to the GDP. Harmse deduced from this that the information sector is an important economic sector in South Africa (Boon et al, 1993, p121).

4.3 SOUTH AFRICA COMPARED TO OTHER COUNTRIES

"Countries with higher growth rates in IT investment achieved consistently higher growth rates of GDP and Productivity" Kraemer and Dedrick (1994a, p1921)

This section will briefly examine policy options and the IT situation in four countries, and then compare this to the situation in South Africa.

4.3.1 Singapore

Singapore has an authoritarian government which has been in power for the past 30 years. This government denies opposition and limits human rights and basic freedoms says Christie (1995, p73).

According to the WCR (1995) the country's economic environment is good, with a GDP per capita of US$23 619 in 1994 (p364), unemployment at 2,6% (p718) and an inflation rate of 4,5% (p376). The WCR ranked Singapore first in Finance, and 2nd in both Domestic Economic Strength and Internationalisation (WCR, 1995, p271).

Singapore had 0,125 computers per capita in 1993 (Wood, 1993, p477), and was ranked 12th in Infrastructure (WCR, 1995, p271) in 1995.

A national IT plan was drawn up in 1986 to maximise IT potential. This plan contained seven strategies to improve productivity and generate new business. They were;

- IT manpower
- IT culture
- Communications infrastructure
- IT applications
- IT industry
- Climate for creativity and entrepreneurship
- Co-ordination and collaboration (Pek Hooi Soh and Ang, 1993, pp42-43).

Yellan and Sanford (1995, p5) comment that there is ongoing discussion of which came first - growth in the economy or an increased diffusion of IT. The relationship between IT and the economy has probably promoted their simultaneous growth. The government has adopted the "increased IT employment leads to economic growth" approach. Governmental actions taken to increase the level of IT in Singapore have included; development of a national IT plan complete with boards, committees and authorities, tax relief for R&D expenditure, proactive plans for absorbing the excess labour as IT pushed the economy through first (import substitution) and second (export based international business) stages of their economic growth.

MNCs were encouraged to locate advanced manufacturing activities in the country, and today Singapore is the world's largest producer of hard disc drives. The MNCs are supported by local contractors who supply various components. The public sector has

been heavily computerised to make government more effective and responsive to the needs of business. Applications such as Tradenet (the system linking port facilities, government offices and private trading companies) have improved the speed and efficiency of the harbour (Dedrick et al, 1995, p22).

Singapore had an adult illiteracy of 13,9% in 1990 (WCR, 1995, p726). Her people were ranked first in 1995, and her management 5th (WCR, 1995, p271).

The country spent 0,88% of its GDP on R&D in 1992 says Wood (1993, p525), and had a ranking of tenth for Science and Technology (WCR, 1995, p271). There were 383,3 telephone lines per 1000 inhabitants in 1993 (WCR, 1994, p470).

4.3.2 New Zealand

New Zealand is one of the most politically stable countries in the Pacific rim, with a small population and centralised system of government say Kraemer and Dedrick (1993a, p367). She has an outstanding result in Government (3rd) and in Management (6th) (World Competitiveness Report 1995, p19).

New Zealand's economy is still dependent on agricultural exports. Competition was introduced into telecommunications, and as a result New Zealand has a first-rate infrastructure (Dedrick et al, 1995, p22). New Zealand is unlikely to become a hardware producer, but with its well-educated English speaking workforce, it has potential to do software development. Problems will be the small domestic market, the distance from

international markets, and the shortage of venture capital (Kraemer and Dedrick, 1993a, p365).

Kraemer and Dedrick (1993a, p370) report that corporate taxes were cut from 45% to 33%, and top personal rates from 66% to 33%. The country is behind developed countries in terms of secondary enrolment (84%) and expenditure on education (4,8% of GNP) (Kraemer and Dedrick, 1993a, p372).

The country had a GDP per capita of US$14 146 in 1994 (p364), unemployment was at 8,1% (p718) and inflation was at a rate of 1,6% (p376). The World Competitiveness Report ranked New Zealand tenth in Finance, 22nd in Domestic Economic Strength and 23rd in Internationalisation (WCR, 1995, p229).

New Zealand had 0,148 computers per capita in 1993 (WCR, 1993, p477), and was ranked 6th in Infrastructure (WCR, 1995, p271) in 1995. The country has never had a formal IT strategy, according to Kraemer and Dedrick (1993a, p376), as it strongly supports free market ideology. The government makes no effort to promote IT use in the private sector, nor does it offer incentives to encourage IT investment, nor any efforts to create public awareness of the value of IT (Kraemer and Dedrick, 1993a, p380). Jackson (1995a) provided statistics which indicate that 2,8% of all people employed in New Zealand now worked in the IT industry, and that 19% of homes now had a PC.

New Zealand has an adult illiteracy of 1,5% in 1990 (WCR, 1995, p726), and her People were ranked twelfth in 1995, and her Management sixth (WCR, 1995, p229).

The country spent 0,88% of its GDP on R&D in 1992 (WCR, 1994, p525). Kraemer and Dedrick (1993a, p372) say R&D expenditures are relatively low, the public sector carries the majority of the costs . New Zealand had a ranking of 22nd for Science and Technology (WCR, 1995, p271). There were 447,2 telephone lines per 1000 inhabitants in 1993 (WCR, 1994, p470).

4.3.3 Australia

Australia is a stable democratic decentralised federal state (Dedrick and Kraemer, 1993, p337). Australia is a developed country, but it's wealth is based on successful exploitation of it's natural resources. It's continued prosperity is threatened by the steady decline in prices of it's primary goods (Dedrick and Kraemer, 1993, p334).

Government intervention with policies of protectionism, state ownership, and subsidies were responsible for creating largely inefficient, uncompetitive industries (Dedrick and Kraemer, 1993, p334). The government embarked on an economic liberalisation program in the late 1980s which included deregulation of industry, lowering of trade barriers and rationalisation of government operations, deregulation of financial and banking sectors, reduction in income tax rates and strict spending limits (Dedrick and Kraemer, 1993, p339). According to the WCR Australia had a GDP per capita of US$17 995 in 1994 (WCR, 1995, p364), unemployment was at 9,7% (WCR, 1995, p718) and inflation was

at a rate of 1,6% (WCR, 1995, p376). The World Competitiveness Report ranked Australia sixteenth in Finance, 23rd in Domestic Economic Strength and 31st in Internationalisation (WCR, 1995, p55).

There is little domestic IT production, most IT is imported free of tariff according to Dedrick and Kraemer (1993, p335). Australia has no IT policy. There are no restrictions on foreign investment in IT production (Dedrick and Kraemer, 1993, p346).

There is a generally well-educated English speaking work force with an adult literacy rate of 99% (Dedrick and Kraemer, 1993, p341). Government promotion of R&D includes tax incentives, grants, subsidies, and direct funding (Dedrick and Kraemer, 1993, p349). Australia spent 1,34% of its GDP on R&D in 1992 (WCR, 1994, p525). The Purchase Australia Office encourages government agencies to buy local products, but often the best value is an imported product say Dedrick and Kraemer (1993, p351).

Telecommunications in Australia is primarily the responsibility of the state owned company, Telecom, which has a monopoly over telecommunication transmission services (Dedrick and Kraemer, 1993, p342). There were 486 telephone lines per 1000 people in 1993 (WCR, 1994, p470).

4.3.4 India

India is a federal republic, and is the worlds largest democracy. The country's economic environment is poor with a GDP per capita of US$289 in 1994 (WCR, 1995, p364), and an inflation rate of 11% (WCR, 1995, p376). The World Competitiveness Report ranked India 30th in Finance, 28th in Domestic Economic Strength and 40th in Internationalisation (WCR, 1995, p163).

India had 0,001 computers per capita in 1993 (WCR, 1994, p477), and was ranked 43rd in Infrastructure (WCR, 1995, p163) in 1995. A national IT policy was developed in 1971, with the goal of achieving technological independence. This interventionist policy reduced access to foreign IT, which led to inefficiency in large sectors of the local industry and to them using outdated IT says Tolentino (1993, p392). Import duties on PCs are 107%, and software packages have an 85% duty. The result is IT prices are extremely high and India suffers from under computerisation according to Nidumolu and Goodman (1993, p20-21).

There are however policy incentives such as the software technology parks that attract local software firms. Firms located in these parks are allowed duty-free imports and exports, a five-year tax holiday, foreign firms can repatriate profits, and either exemptions or subsidies are allowed for sales and excise tax, rent, power and water (Hanna, 1995, p523). The number of Indian software export companies has grown to 130 in the past five years, providing employment for over 100,000 programmers. Export

revenues were up to US$500 million for the year ending March 31,1995 (Viehland, 1996).

India had an adult illiteracy of 51,8% in 1990 (WCR, 1995, p726), and her People were ranked 47th in 1995, and her Management 39th (WCR, 1995, p163).

The country spent 0,88% of its GDP on R&D in 1992 (WCR, 1994, p525), and had a ranking of 35th for Science and Technology (WCR, 1995, p271). There were 7,8 telephone lines per 1000 inhabitants in 1993 (WCR, 1994, p470).

4.3.5 Brazil

Brazil has a presidential federal republic, headed by a president who is elected for a non-renewable 5 year term.

Brazil had a GDP per capita of US$2 990 in 1994 (WCR, 1995, p364), and an inflation rate of 2300% (p376). The World Competitiveness Report ranked Brazil 37th in Finance, 44th in Domestic Economic Strength and 36th in Internationalisation (WCR, 1995, p73).

There were 0,007 computers per capita in 1993 (WCR, 1994, p477), and Brazil was ranked 37th in Infrastructure (WCR, 1995, p73) in 1995. The Brazilian government wanted to keep pace with world-wide developments in IT, so it developed a national IT policy (Roche, 1990, pp 1-32). The policy was aimed at avoiding dependence on foreign

technology, capital, or management. Restrictions were imposed on the importation of foreign goods (Roche, 1990, p4). In spite of this Brazil built up the largest IT industry in Latin America, it educated and trained technicians, it conducted IT R&D, and the Brazilian IT industry expanded at the rate of 30 % per year (Roche, 1990, p22).

Brazil had an adult illiteracy of 18,9% in 1990 (WCR, 1995, p726), and her People were ranked 35th in 1995, and her Management 32nd (WCR, 1995, p73).

The country had a ranking of 29th for Science and Technology (WCR, 1995, p73). There were 69,7 telephone lines per 1000 inhabitants in 1993 (WCR, 1994, p470).

4.3.6 Comparisons

A matrix comparing various factors of the different countries is included as appendix A.

The extent to which the South African government's policies (38th) are conducive to competitiveness was ranked (WCR, 1995, p277) lower than any of the countries in the comparison. The inference is that the South African government needs to develop some policies which will stimulate the country's competitiveness, an ITP is one such policy.

In terms of the economy, South Africa again fared poorly, with the highest unemployment rate, the third highest inflation rate, and the second lowest savings percentage. South Africa's ranking in terms of financial performance was respectable, but poor rankings in domestic economic strength, and internationalisation were alarming.

Countries which used protectionist policies appear to be worse off than those who follow the free market approach. These figures are unlikely to change without strong governmental action. The unacceptably high unemployment rate needs urgent attention. South Africa needs to become more competitive in the global economy in order to create jobs. IT is one aspect which can assist the country to become more competitive if properly planned.

The country's infrastructure is one of her few strengths, and gave South Africa her highest ranking (19th) in the eight major factors in the WCR (WCR, 1995, p27). Infrastructure includes criteria such as telecommunications infrastructure, computers per capita, share of world-wide computers in use, and computer power per capita. The conclusion is that South Africa must build on this strength, she must not allow this strength to be weakened. There are many areas which can be improved, but they need to be properly planned. An ITP would help improve the IT aspects of South Africa's infrastructure.

South Africa's weakest point is human resources. The infant mortality rate is too high, as is the population growth rate, and the adult illiteracy rate. The 'brain drain' is sapping an already weak resource. In the WCR of 1995, South Africa's People ranked last (48th), and our management did not rank too highly (35th). Criteria in people, in which South Africa ranked last, include availability of skilled labour, level of compulsory education, economic literacy among population, and worker motivation.

South Africa's weaknesses under Science & Technology include the lack of incentives for R&D, and the teaching of science education in schools.

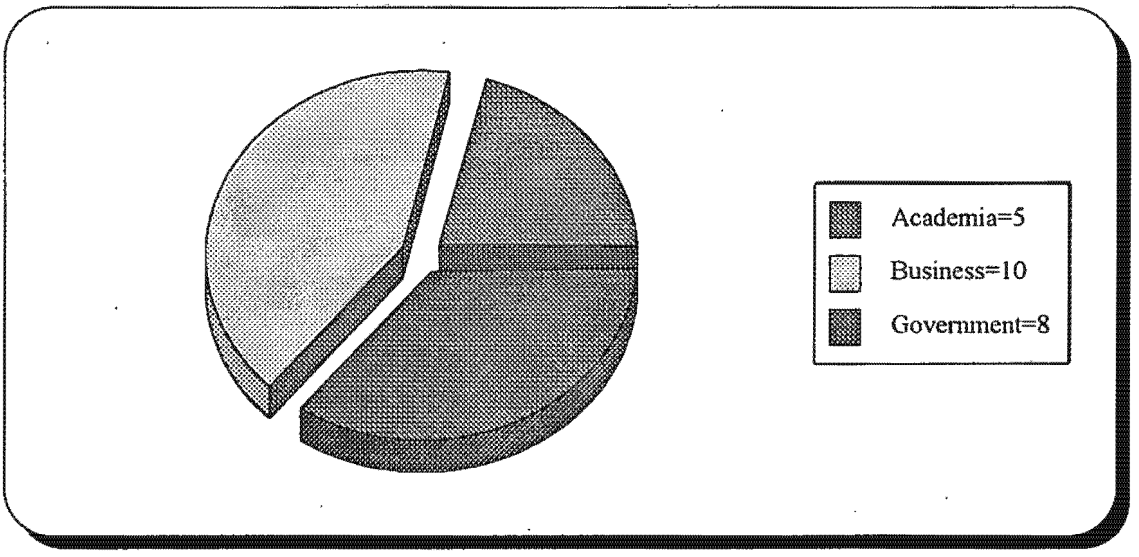
Problems under Telecommunications are the state monopoly held by Telkom.

4.4 RESULTS OF OPINION SURVEY

"Where an opinion is general, it is usually correct", Jane Austen (1775-1817)

Appendix B lists all the questions with responses to the survey. The majority of the respondents showed a high degree of interest in the topic, and requested a summary of the findings. For ease of reference and confidentiality, I have labelled the respondents by a letter of the alphabet, Academics are A-E, Business respondents G-P, and government responders Q-X.

Twenty-three replies were received from 60 questionnaires distributed, a 38% response was recieved. The spread of responses from different sectors is shown below.



4.4.1 Academic Responses

Received a 45% response from Academia, of which two were international responses. Seven questions received positive answers from all the academic respondents. All agreed that the government must balance its policy options (Q3), IT could create competitive advantage in other economic sectors (Q4), government should consult when drawing up an ITP (Q5), IT should be taught in high schools (Q10), companies should be allowed to compete with Telkom (Q16), the benefits of developing an ITP are desirable (Q30), and an ITP is the correct way to achieve these benefits (Q31).

No question received a totally negative response, although only respondent felt South Africa should start a 'buy South Africa' campaign (Q20), which he qualified with a remark "only if the products are equal to the foreign products".

Parts of five other questions received unanimous support. All indicated that: the IT industry should be deregulated (Q9); government should push IT in the public sector (Q15); IT could transform the quality of government service by accurate on-line information, and access to information (Q19); government departments creating their own ITPs would result in duplication (Q25); education and training, R&D, technology transfer, data communications, regular review of ITP, IT in the public sector and universal telecommunications access should be covered by an ITP (Q29).

One South African academic, A, felt that the South African government first needs to sort out who will control IT and what their role will be before developing an ITP (Q1).

A and C felt that South Africa should not promote co-operation with other African states, as they have little to offer and would hinder our development (Q7).

Respondents were divided over the issue of legislation to ensure foreign companies spend a proportion of local turnover on co-operative R&D (Q13), C felt this contradicts free trade, and coercion was not the way to encourage foreign companies to invest in South Africa.

A commented that a new 'Technology' department should be created to run ITP (Q23). B was vague on several questions as he was unfamiliar with the South African situation.

Several interesting comments came from C, some of which follow: South Africa has talent in IT and if we found a niche we could achieve international competitiveness (Q2). South Africa must avoid the pitfalls of short-term thinking, and must start planning for the longer term (Q3). More technoparks must be developed, and strategic alliances entered into with MNCs as ways to increase our IT competitiveness (Q9). IT could improve distribution of economic and social benefits by assisting functionally illiterate people to do jobs, and by making more small businesses viable (Q18). South Africa should not look to developing a hardware industry as we do not have the necessary skills or resources (Q21). Rather than allow each province / department to develop its own ITP, each could develop the part of the ITP allocated to them through negotiation (Q26). Initiatives to enhance competitiveness of small businesses should be limited to

providing a sound infrastructure. No tax breaks or subsidisation should be allowed (Q27). IT is a source of power and society needs safeguards to prevent abuse (Q32).

D suggested that most benefits from IT would accrue from creating competitive advantages in other economic sectors (Q4). Other comments from D were that imported IT should include a commitment to train locals to avoid having under-utilised IT (Q17). 'Buy South Africa' type campaigns had not had success anywhere - competition was essential (Q20). A common Health System is a must (Q24). Most important initiative to enhance competitiveness of small businesses is training (Q28).

Comments from E were as follows. Incorporating IT into products and services would create competitive advantage in other economic sectors (Q4). Government should consult widely on ITP, and it is showing increasing support for the participation (Q6). Companies should be given tax relief for IT R&D as it's a new territory and they need encouragement (Q12). Government should generate a demand for IT by pilot projects, and by publicising successes (Q14). IT could improve distribution of benefits by enabling decentralisation of work, and spreading education (Q18). Government has no need to provide incentives for MNCs to do business in South Africa, as we are seen as an emerging market, and hence a sellers market (Q22). Provinces are creating their own ITPs like it or not (Q25).

4.4.2 Business Responses

Received a 71% response. There was not as much consensus among the business people as among academics. Only two questions received positive answers from all the business respondents. As with the academics, all agreed that IT could create competitive advantage in other economic sectors (Q4). The business respondents were at one that South Africa should promote IT co-operation with neighbouring states (Q7). Apart from respondent K who did not answer, all felt IT should be taught in high schools (Q10), and companies should be allowed to compete with Telkom (Q16). Seven agreed that South Africa should have a National Health IT system (Q24).

No question received a totally negative response. IT is a source of power (Q32) received three positive responses qualified with the remark that IT can present an entry barrier to small companies. Q20 asked whether South Africa should start a 'buy South Africa' campaign. Three of the respondents replied in the affirmative, but they qualified their answers by adding that such a campaign must not be legislated, and should only be for competitive products.

All indicated that the IT industry should be deregulated (part of Q9), as did the academics.

Respondents H and I felt it was too soon for the South African government to develop an ITP (Q1). The remainder commented that it was needed to co-ordinate IT resources, to improve the infrastructure, to avoid duplication and contain costs. P added that an ITP

was essential to balance commercial interests and to ensure that IT is directed towards a wide range of social goals.

Q3 asked whether policy options must be balanced. H disagreed as he felt that balance implied 50/50 and some areas should have higher priority than others. K did not understand the concept of balanced policy. I and K felt there was no reason for Government to consult when drawing up an ITP (Q5), as it would just slow the process. L was sceptical, and worried about 'bogging down in democracy', and the wrong people being consulted at great expense. L suggested a feedback process to stakeholders at key points in the process. He identified stakeholders as all major IT users. The author feels that this is a somewhat narrow definition of stakeholders, as potential users and communities could be included.

Creating an IT profession, incentives for product development, and including IT in education were additional suggestions to increase our IT competitiveness (Q9).

Apart from G and K, all agreed that companies should be given tax relief for IT R&D (Q12). G stated that South Africa should not be 'on the leading/bleeding edge, rather use well-tried and tested IT. P added a proviso that only if it was for general use.

Respondents were again divided over the issue of legislation to ensure foreign companies spend a proportion of local turnover on co-operative R&D (Q13). H felt legislation was required to get commitment, I, L and M said legislation should be incentive based rather

than penalties and compulsion. N and O felt legislation would deter investment in South Africa, and that investors must be free to operate as they see fit within the grounds of international practice.

Should Government generate a demand for IT (Q14)? G and L were opposed to this as they felt that growth should be natural and not artificially stimulated by government. Government should only generate a demand through education said P. J suggested government generate demand by example, by improving it's IT. Compulsory IT education at schools was the only additional idea for generating a demand for IT (Q15).

Reasons why legislation should ensure that imported IT includes a commitment to train locals (Q17) include:

- to force businesses to train staff (H)
- I, L and M stated that legislation must be incentive based
- O felt no legislation was required to achieve this.

Additional suggestions for ways in which IT could improve distribution of economic and social benefits (Q18) included: having accurate national statistics which could be used for forecasting (G); distance education (H); internet and cottage industry (P).

Q21 asked whether government should promote a local IT industry. G was strongly opposed to this, as he felt that there were no benefits for the country in doing so, South Africa should always use the best available. J and M were pro an South African industry,

as it would create jobs. L and O qualified their support by saying that promotion should encourage local industry through incentives, but these must not make it easier for local industry to compete.

Should Government provide incentives for MNCs to do business in South Africa (Q22)? G, H, L, M and N said yes. They added that taxes need to be reduced, South Africa needs exposure to international trends, and foreign investment needs to be encouraged. I, J and O felt it should be left to supply and demand, and government should rather remove disincentives such as forex control. P was worried on what basis these incentives would be provided.

N commented that he was involved in a workshop with the Gauteng Province to develop an ITP for the province (Q25). According to N, their view is that if they are successful they will try and promote this as a national strategy. N adds that the existing government and provincial IT systems were developed in isolation and resulted in an unco-ordinated strategy, duplication, redundancy, incompatibility and high costs.

Should each province / department be free to develop its own ITP co-ordinated by a national IT Agency (Q26)? Five respondents say yes, in order to integrate national statistics (I), encourage integration (J), to ensure it is correctly managed (O). G,L and N reject the idea. G states South Africa needs a national, shareable co-ordinated policy. L and N suggest that first a high level national policy should be developed, provinces and departments should then develop their own supporting policies.

The majority felt that initiatives to enhance competitiveness of small businesses should be taken (Q27). Additional initiatives to enhance competitiveness of small businesses (Q28) listed were, venture capital (G), subsidies and deregulation (N), tax incentives (I, H and N), and trade courses (P).

No additional items to be covered by an ITP were mentioned (Q29). The majority felt that the benefits of developing an ITP are desirable (Q30), and an ITP is the correct way to achieve these benefits (Q31).

4.4.3 Government Responses

Received a 31% response. Only three questions received all positive answers. As with the academics, all agreed that government should consult when drawing up an ITP (Q5), and that companies should be allowed to compete with Telkom (Q16). The government respondents also endorsed Q19 which gave ideas on how IT could transform government service quality - adding more efficient government (Q, R), professional service (R), and reduced government expenditure (U).

Two respondents were against South Africa developing an ITP (Quelch and Austin, 1993), R felt it could not be a priority at this stage, and V is against ITPs as he feels they hinder departments core work. V is totally opposed to government subsidising, developing, encouraging, giving incentives to any party for any thing (in his words "all the weasel words to justify giving funds in response to lobbying") .

All agreed that Government must balance its policy options (Q3), except for V who disagrees with government having an ITP. Apart from respondent X, all felt IT should be taught in high schools. V proposed it should also be taught in primary schools, and not only as a subject, but that everything should be taught with IT (Q10).

Five agreed that South Africa should have a National Health IT system (Q24). R was opposed to such a system. U and V were unsure.

All except R felt IT could create competitive advantage in other economic sectors (Q4). The government respondents almost all felt that South Africa should promote IT co-operation with neighbouring states (Q7), Q was unsure, and X was opposed to it with no reason given.

No question received a totally negative response. Q8 asked whether IT productivity in South Africa was better than overall productivity in South Africa, it received only one 'yes' from government respondents. IT is a source of power (Q32) received only two positive responses qualified with the remarks that only if it is restricted to small groups by tariffs, licensing and inadequate education.

South Africa could increase its IT competitiveness (Q9) by: minimising regulation and being transparent (T and V), education (R and U), and R&D (U).

Respondents were divided on whether companies should be given tax relief for IT R&D (Q12). U feels government should give tax relief to local companies, but not to MNCs. R says free market mechanisms should not be tampered with. A stronger view is expressed by V, who say it will reduce economic efficiency while costing taxpayers money.

The issue of legislation to ensure foreign companies spend a proportion of local turnover on co-operative R&D (Q13) drew mixed reaction. U felt legislation was fine as long as it did not reduce the input required to get industry started. Q felt incentives would be better than legislation. V stated that enforced co-operation is an oxymoron. W said it would result in increased costs for all.

Should Government generate a demand for IT (Q14)? The majority were opposed to this. W felt that growth should be natural, not artificially stimulated. V remained opposed to any form of government intervention. T stated government should generate demand by example - by improving its service using IT. Q said as the government was a large IT user, it could generate demand and so grow local companies as was done by Singapore.

Introduce IT education into schools, encourage R&D were the only additional ideas for generating a demand for IT (Q15).

Reasons given for why there should not be legislation to ensure that imported IT includes a commitment to train locals (Q17) were : market forces would do it more effectively (T), and V stated that this would represent an increased cost on imported goods.

Suggestions for additional ways in which IT could improve distribution of economic and social benefits (Q18) included; having a cheap effective telecommunications infrastructure, improved access to information for all, and education.

Should government start a 'buy South Africa' campaign (Q20), received only two positive responses. Some comments against it were that government should support open standards not proprietary solutions (T), it will hamstring local non-IT industry (V), the open market should be promoted (W), exploit the best IT irrespective of its origin (Q).

Q21 asked whether government should promote a local IT industry. R and V were strongly opposed to this, as they felt it would cost the taxpayer money, and interfere with market forces. The remainder of the respondents were for promoting an South African IT industry especially a service industry which would have a better understanding of local conditions.

The response to Q22 - Should Government provide incentives for MNCs to do business in South Africa - was split 50/50.Those in favour said it would promote investment in South Africa (R), and it could help boost local industry (Q). Those against said: it was equivalent to robbing Peter to pay Paul (V), it may stunt local industries (U and W), it should be left to supply and demand (T).

Q23 asked which government department should be in charge of an ITP. Answers ranged from Public Administration (T), independent statutory body (W), industry development (U), Public Service (S). Interestingly, not one response proposed the department they were working for.

The majority of respondents felt that each province / department should be free to develop it's own ITP co-ordinated by a national IT Agency (Q26). Only two (T and V) reject the idea. T feels national co-ordination is required and V is opposed to all ITPs. The rest of the respondents give reasons such as to retain independence (W), co-ordinated decentralisation removes bottlenecks (Q). The author fears that W's response has wide support in government departments and provinces.

Most of the government respondents felt that initiatives to enhance competitiveness of small businesses should be taken (Q27). Additional initiatives to enhance competitiveness of small businesses (Q28) listed were: knowledge acquisition and sharing, competitive business environment with a competitive infrastructure (V); information transfer (R); remove legislation which may inhibit small businesses taking on new staff such as unfair dismissal laws (U), and tax reductions (W).

No additional items to be covered by an ITP were mentioned (Q29). The majority felt that the benefits of developing an ITP are desirable (Q30), and that an ITP is the correct way to achieve these benefits (Q31).

The last three questions were only sent to government respondents, and they were requested to answer from their particular department's perspective. Q35 asked whether the department had developed, or intended to develop its own ITP. Q36 asked whether other departments were or would be consulted, and Q37 asked which departments had been, or would be consulted. Only five departments respondents chose to answer these questions.

The Defence Force has its own ITP to co-ordinate the Army, Air Force, Navy and Medical Services capabilities and to ensure inter-operability. They consulted Land Affairs for data on GIS, Health, and Transport.

The Education Department hopes to develop an ITP within the next two years, and will consult Provincial Education departments.

The Housing Department has an ITP, and they consulted the Public Services Commission, Land Affairs, Transport and Local Government.

The Department of Agriculture is working on a strategy, and are consulting the Provincial Agricultural departments and the Department of State Expenditure.

The Department of Transport has an ITP, and they consulted the Provinces.

4.4.4 Overall Response

No replies were received from the 8 questionnaires sent to societies, politicians, IT vendors and IT journalist. Perhaps the percentage of replies per sector indicates the level of concern - lowest in the general area (societies, politicians etc.), second lowest in government departments. Q17 received a positive response rate of 57%, this question was derived directly from section 4.4.8.6 on page 97 of the RDP. No question received unanimous support.

4.5 FINDINGS

"We often discover what will do, by finding out what will not do: and probably he who never made a mistake never made a discovery" Samuel Smiles (1812-1904)

This section presents the findings as follows: Consensus between the literature and the opinion survey, conflicting issues between the literature and the opinion survey, a summary of some additional comments made by respondents, and finally a gap analysis.

4.5.1 Consensus between the literature and the opinion survey

The key issues found in the literature search were reinforced in the opinion survey. Certain issues had more emphasis in the opinion survey than in the literature and visa versa. The main points of agreement are summarised below, in list form with no attempt to 'order' them according to levels of agreement:

- South African government should develop an ITP with consultation as soon as possible

- An ITP should take cognisance of the country's other policies, and seek a balance with them
- IT could create competitive advantage in other economic sectors in South Africa
- South Africa should promote IT co-operation with neighbouring African states
- IT should be taught in high schools in South Africa
- South African government should generate a demand for IT by pushing IT in the public sector
- People need improved access to information
- South African government should not start a 'Buy South African' IT campaign
- South Africa should promote a local software industry
- Government should provide incentives for MNCs to do business in South Africa
- Government should provide training initiatives to enhance the competitiveness of small businesses
- Items which should be included in an ITP are:

1. National IT Committee
2. Education and Training
3. R&D
4. Technology Transfer
5. International co-operation and MNCs
6. Protection of intellectual property
7. Government application projects
8. IT in the Public sector
9. Small business development

10. IT in schools

4.5.2 Conflicting issues between the literature and the opinion survey

There were no major conflicting issues, although certain factors received more emphasis in the opinion survey than in the literature and visa versa.

Summary of issues which received more emphasis in the opinion survey:

- Deregulation of industry
- Tax reductions and free trade agreements to increase competitiveness
- Tax relief for IT R&D expenditure
- Deregulate the telecommunications sector, and allow competition with Telkom
- Development of a National Health Information System
- Government should promote a local IT services industry
- Government departments and or provinces creating their own ITPs could result in duplication, incompatibility and redundancy
- Data communications, universal telecommunications access and standards should be included in ITP
- ITP should be regularly reviewed

Respondents were undecided on the following issues:

- The percentage of GDP the South African government should spend on R&D
- Whether legislation should be passed to ensure MNCs spend a certain proportion of local turnover on co-operative R&D projects

- Whether legislation should be passed to ensure imported IT includes a commitment to educate and train local people to use, maintain and extend it
- Which government department should be in charge of an ITP

4.5.3 Summary of additional comments made by respondents

The following are some of the comments made by respondents in response to questions from the opinion survey.

- South Africa can achieve international competitive advantage in the IT industry as "we have the talent", we should "build on our few international software products",
- South Africa should not promote IT co-operation with Africa as they are "too far behind us", "have little to offer", "we can help them later",
- South Africa should promote IT co-operation with Africa as "strongly dependent on your neighbours whether you like it or not", "notion of South Africa as the IT powerhouse of Africa", "prospects of increased business", "provided it doesn't cost money. Don't do foreign aid on IT budget", "area in which South Africa can make major contributions", "benefit from each other's experience",
- IT should be taught in high schools as, "we're entering the information society", "IT concepts should be compulsory", "teaching IT as a subject, while important, is less important than teaching everything with IT", "as a life-skill tool", "educate children to be competent in IT", "basic requirement for any career", "essential part of modern life", "primary schools as well",

- Companies should not get tax relief for R&D, "tax evasion", "if you muck about with subsidies you will reduce overall economic efficiency while costing your taxpayers money",
- Government should allow competition to Telkom "if South Africa wants a competitive economy", "competition must benefit us", "monopolies are unhealthy", "free market approach", "need the best infrastructure you can get - you won't get it if you're reliant on politicians to invest in it when there are so many sexier things for them to do with tax funds", "government intervention should as a general rule be kept to a minimum", "reduces cost of service", "creates jobs", "some competition is good, but not a free-for-all", "no company should be protected from fair competition",
- Government should not start a 'Buy South Africa' campaign, "South African products should be internationally competitive", "not a route that has had success anywhere", "we have too little to offer", "will reduce the quality of solutions", "South Africa is not competitive in this area",
- Government Departments which should be in charge of ITP included: "Technology", "where the champion is", "IT", "Science & Technology", "Public Service", and "Public Administration". It is interesting that most respondents choose 'departments' which do not currently exist, and the two respondents who choose Public Service and Public Administration actually choose the same department, that of "Public Service and Administration".
- South Africa should have a National Health IT System: "reduce fragmentation of health care resources", "should be shared with other departments", "scarce

resources require centralisation of effort and co-ordinated decentralised execution",

- Each province/department should be free to develop it's own ITP, co-ordinated by a national IT agency: "I shudder at the thought of trying to get the provinces to agree on a common system", "more riders on the gravy train".

4.5.4 Gap analysis

This section identifies gaps in the literature on ITPs in South Africa, gaps between South Africa and other countries, and gaps between the opinion survey and the research.

South African currently has a low competitiveness ranking. This is unlikely to change without government intervention. The government needs to stimulate the country with policies, and there is currently a gap in terms of an ITP for South Africa. Ideally this ITP should be developed by government after wide consultation with industry, academics, and professional bodies. Care must be taken on the kind of policies implemented - protectionist type policies can harm a country's competitiveness.

An ITP needs to be co-ordinated, planned and implemented by a committee or agency appointed by government, as was done in Singapore and Chile. No such body has been appointed as yet in South Africa.

There is a lack of accurate data and statistics on South Africa as a whole. This makes it difficult to plan and make strategic decisions. There is a dire need for a consolidated

reliable set of data on the country. The lack of accurate facts about South Africa's IT endowments are one aspect of this problem. A survey of all laws and government policies which impact, or could impact IT and telecommunications is required to understand what needs to be changed.

South Africa's national telecommunications infrastructure is one of her strengths, but can be strengthened. In parts of the country the teledensity is extremely low. A huge opportunity exists to link all the parastatal telecommunications infrastructures and so expand and increase capacity of the national infrastructure (Skweyiya, 1994, p67). A second opportunity is to restructure the telephone fees so that national and international calls do not subsidise local calls. A third option is to deregulate the telecommunications infrastructure as done in New Zealand and Chile - opinion is that this would improve the service and reduce the fees.

Dr Zola Skweyiya(Skweyiya, 1994, p67), the South African Minister for the Public Service and Administration, wrote "apartheid has left us with a fragmented public service and with incompatible and duplicated information systems." Dr Skweyiya also noted that Public Service had a shortage of skilled IT personnel. There is no integration, no standards and little consultation between state departments regarding their IT. The re-organisation of the country's local authorities means that a large number (over 800) of these authorities need to be restructured and reprogrammed. An ideal first step would be that all of the state departments could link to each other share information with each other.

There is no co-ordination of state planning or spending on IT. Each department and province seems to be going their own way. The amount of duplication is enormous. The Health department has put out a tender for a NHIS, and the government has committed to spending money on the United Nations Copine initiative which is going to overlap with the NHIS. Furthermore, the responsibility for implementing the NHIS rests in the provinces, who all have different needs and resources (Braa and Power, 1995,137). The question arises will all provinces co-operate and commit to the NHIS, or will it become a fragmented system working in some places and not in others?

South Africa's financial services are in good shape, and have extensive networks over the country extending to international markets. They have developed networks of branch offices linked to central sites.

South Africa's expenditure on R&D is dropping, and currently no incentives are offered to organisations to do R&D, and the access to venture capital is limited. There is an opportunity to offer incentives such as accelerated depreciation for R&D which benefits South Africa's people. Research into how our resources can be better utilised with appropriate technology, how to fully exploit existing technology, and how to modify technology so it better serves the people of South Africa, needs to be done.

South African companies have produced some innovative hardware and software products. The opinions gathered suggest that South Africa should encourage the development of the software industry. Export incentives should be examined.

An area of almost lost opportunity exists in the rapidly dwindling expertise of the former military establishment. Many of the highly skilled people were retrenched, and are now doing less complicated jobs which do not require their skills, or are leaving the country. An opportunity exists to offer them places in technology parks, where they can better utilise their expertise. Many of these individuals have experience in undertaking large projects successfully, and this expertise could be harnessed in projects such as linking of state departments. In addition, South Africa has a percentage of highly innovative and entrepreneurial people who must not be lost to the country. South Africa needs to provide them with incentives.

South Africa's people were ranked last in the 1995 World Competitiveness Report. South Africa has a high infant mortality rate, a high illiteracy rate and a high unemployment rate. Additional problems include the number of official languages (11), and the imbalanced school system. IT should assist in increasing literacy, providing stimulus and information to communities.

The schools do not offer IT as a subject, generally the teaching of science is poor, and many schools do not use IT for administration. Teachers need training in the benefits and use of IT.

Computer literacy among employees received a very low rating, one can extrapolate from this that the general public's computer literacy is also low.

One of the largest gaps exists in the rural areas which have been left underdeveloped. The networked community centre idea could be exploited to vastly improve the quality of life of the people living in these areas.

South Africa is regarded as a regional power, has an opportunity to become the IT leader in Africa. Dr Pallo Jordan, Minister of Posts, Telecommunications and Broadcasting wrote (Jordan, 1994, p42) that "South Africa has the potential to become a hub for Sub-Saharan Africa and the node in the Southern Hemisphere". South Africa should promote IT co-operation with neighbouring African states. Africa offers a huge potential market to South Africa to export our services and skills, as well as any products we may develop.

A gap exists in South Africa in developing co-operative agreements with MNCs. MNCs are starting to look at South Africa, and if South Africa is proactive she can negotiate beneficial agreements with these corporations.

Research and the survey indicate that legislation should be passed to ensure that imported IT includes a commitment to educate and train local labour to use, maintain and extend the technology.

CHAPTER FIVE RECOMMENDED IT POLICY FOR S A

"If we do not find anything very pleasant, at least we shall find something new" Voltaire (1694-1778)

The recommended ITP for South Africa has the following structure:

5.1. Introduction to the South African ITP.

- 5.1.1 Scope and Objectives
- 5.1.2 Constraints and Limitations
- 5.1.3 The value of IT to South Africa

5.2. Focus Areas of ITP

- 5.2.1 Developing our Human Resources
- 5.2.2 IT Infrastructure
- 5.2.3 Industry Development
- 5.2.4 Developing Communities
- 5.2.5 Developing our Public Service
- 5.2.6 Government Projects

5.3. The Next Step - Beyond 2000

5.1 INTRODUCTION TO THE South African ITP

This recommended policy attempts to offer a realistic proposal for South Africa to implement an Information Technology Policy. This recommended ITP was drawn up using material from the literature search, comparisons to other countries, opinion survey

data, and the gap analysis. The RDP (1994) was a constant source of reference, as was Vietnam's Policy on Information Technology Development (1993), and Pek Hooi Soh and Ang's paper on the Singapore Government's role in Computerisation (1993, pp39-47).

The opinion survey and the literature search both emphasised the need for South Africa to develop a national ITP as a matter of priority. This recommended policy will hopefully contribute towards the debate surrounding the role of the South African government in IT.

This recommended ITP endeavours to adhere to the six basic principles of the RDP. These six principles are:

1. An integrated and sustainable programme,
2. A Focus on people's needs,
3. Promoting peace and security for all,
4. Nation-building
5. Link reconstruction and development,
6. Democratisation of South Africa (ANC, 1994, pp4-7)

Government should appoint a national committee to take responsibility for the ITP.

5.1.1 Scope and Objectives

The scope or aim of this ITP is to make South Africa the IT hub of Africa.

The strategies to do this are:

- Develop South Africa's human resources through education and training programmes
- Take advantage of, and improve, South Africa's telecommunications infrastructure
- Develop South Africa's IT Industry to enable South Africa's economy to compete internationally
- Develop South Africa's communities, specifically her rural communities
- Develop South Africa's Public Service IT to ensure transparency and openness
- Create a National IT committee to plan, co-ordinate, implement and review ITP.

5.1.2 Constraints and Limitations

The first constraint was the lack of an accurate, up to date inventory of South Africa's IT applications, data bases, hardware, human resources, telecommunications infrastructure and projects. A lack of accurate statistics on South Africa was also a constraint.

A second constraint was that the author worked outside the government structures and was, therefore, not able to acquire certain information, and was obviously not privy to all government deliberations, plans, constraints and limitations. No government approval was asked for or given, and this report does not reflect the governments view (s) in any way.

The South African environment is experiencing rapid change as it moves towards it's new objectives. Coupled to this, the rate of IT change is accelerating. Hence, the results of this study cannot be expected to remain current for more than 12 to 30 months. As a result, the recommendations are intended for implementation in the near future. The costs in lost opportunity and duplication should be calculated of not implementing an ITP within this period.

The work was completed part time by one person, with a limited budget, and therefore this recommended ITP cannot, and does not attempt to go beyond a certain level of detail. Certain items have been identified with no resolution offered. Ideally an ITP should be developed in a negotiating forum with representatives from government, labour, business, professional bodies and academics, and this research provides a baseline for development.

5.1.3 The value of IT to South Africa

IT can uplift the people of South Africa by advancing education, improving health-care, improving the quality of information available, and providing access to expertise. IT allows South Africa's businesses to compete on international markets. Without IT, South Africa's financial sector would grind to a halt within a very short space of time. IT allows for the storage and rapid retrieval of vast amounts of data. South Africa's tourism industry would struggle to survive without IT, air traffic into the country would be seriously affected. IT currently links South Africa to the world through information highways.

IT has the potential to stimulate economic growth and productivity by improving worker productivity, and increasing the returns on investment on plant by improving it's productivity through computerised automation and control according to (Kraemer and Dedrick, 1994a, pp1921-4).

5.2 FOCUS AREAS OF ITP

The ITP focuses on six areas. It aims for the government to develop our human resources, communities, public service, and industries by utilising our IT Infrastructure. All of these areas are inter-linked.

It is recommended that government appoint a committee to take responsibility for the ITP. The make-up and functions of this committee are detailed in section 5.2.6. For ease of reference, this committee has been called the National IT Committee (NIC).

5.2.1 Developing our Human Resources

Research on ITPs has highlighted the following educational issues:

- South Africa's high adult illiteracy rate
- Low computer literacy rate among employees, and general public
- Limited exploitation of IT in schools
- General education levels are racially imbalanced and unknown

No ITP can solve the above problems in isolation. It can however offer recommendations, some of which will need to be integrated with other programmes such as the RDP and the Education Policy.

It is conservatively estimated that over 5 000 000 adults in South Africa are illiterate. The only way to address this is to embark on a massive adult basic education (ABE) programme as per the RDP (ANC, 1994, p63). Various ABE programmes have commenced, some using IT. The NIC must, under the leadership of the Department of Education, assist with the selection of correct computer-supported educational packages, as well as the planning, co-ordination and implementation of the IT aspects of such programmes, ensuring that IT resources are not duplicated or wasted, but are effectively used.

The issue of computer illiteracy is four-fold:

a) South Africa needs to provide high school leavers with IT skills

b) South Africa needs more IT professionals

c) Many of the IT professionals need their skills upgraded

d) Many employee's need IT training.

Using estimates from Singapore (Pek Hooi Soh and Ang, 1993 p,43), it is estimated that South Africa will need approximately 4 500 new IT professionals per annum. In 1994 South Africa's universities produced a total of 1498 IT degrees according to Bishop (Bishop, 1995, p5-7), which is less than a third of the basic requirement. The NIC will

have to determine more accurate targets of South Africa's IT human resource requirements in time. However, it appears that a plan is urgently needed to increase the number of IT professionals being produced, to upgrade many of the existing IT professionals and employees. The NIC needs to address this shortage of IT human resources. As an interim measure they may have to look outside the country for the necessary resources.

Companies need to be encouraged to train employees, and employees need to be encouraged to attend training courses. Legislation should be passed to ensure that imported IT includes a commitment to educate and train local labour to use, maintain and extend the technology. NIC needs to develop incentive schemes (not necessarily financial - could be qualifications, recognition etc.) to give this training process momentum.

A general IT awareness campaign needs to be developed. The public needs to be made aware of IT applications in everyday life. This can be done through IT exhibitions, and conferences (government ministers need to be persuaded to support these events to obtain media coverage). Competitions (such as the Computer Olympiad) must be encouraged and given wider media coverage. Libraries should strive to have an Internet link for reference purposes, and to hold displays on IT related topics.

The issue of IT in schools needs to be addressed. Programmes need to be developed to train teachers in the benefits and use of IT in education. A school curriculum for IT then

needs to be drawn up so that schools can offer IT as a subject. The RDP states that all schools are to have telecommunications services by 1997. Schools need to be equipped with IT to take advantage of this, as well as for teaching, learning and administration purposes. The NIC should assist the education authorities with the selection of computer-supported education programmes for the schools.

Linking all schools to the telecommunications network as per the RDP will be the first phase in getting to understand the education levels in South Africa. Each school will require hardware and software, and training in order for central government to receive correctly maintained statistics.

5.2.2 IT Infrastructure

Research on ITPs highlighted the following infrastructural issues:

- Several unconnected parastatal telecommunications infrastructures exist
- South Africa's teledensity is imbalanced, high in some areas, yet low in others
- Forty percent of exchanges are analogue
- All schools are to have telecommunications links
- State departments' networks are not linked
- National and international call fees subsidise local calls
- Telkom has a huge debt

It is not the aim of this ITP to provide a detailed telecommunications solution to the above issues. That is the prerogative of the Department of Posts and

Telecommunications. This section aims to offer suggestions on improving South Africa's telecommunications infrastructure.

Recommend that the CSIR's proposal (Song and Akhtar, 1995, p59) to link the parastatal infrastructures be considered and, if feasible, implemented. This would increase the coverage of telecommunications across the country, which could alleviate some of the teledensity imbalances. There may be an additional benefit from this rationalisation, in that some analogue exchanges could be replaced.

The RDP's requirement for all schools to have telecommunications links needs to be carefully planned, considering all other state networks. It would be a waste of capital, expertise and telecommunications bandwidth if each government department planned and implemented it's own telecommunications networks. It is recommended that a plan be drawn up of all current and expected future state telecommunications requirements. This plan should then be overlaid onto the linked CSIR network to identify gaps and opportunities. Gaps such as the analogue exchanges need to be noted, and upgrades such as linking all exchanges by fibre optic cable carefully planned.

These findings suggest that the telephone fees are restructured to promote more equitable fee structures, and to encourage educational and R&D use.

A final recommendation would be to investigate deregulating and privatising the telecommunications infrastructure in order to rid the government of the debt.

5.2.3 Industry Development

Research on ITPs highlighted the following IT industry issues:

- South Africa's expenditure on R&D is less than 1% of GDP
- South Africa offers no incentives to companies to do R&D
- Limited access to venture capital dampens entrepreneurial spirit
- Local IT industry is very small

It is important for South Africa to develop R&D capabilities in order to exploit existing technology, and to modify new technology so it better serves South Africa. The first recommendation is that the government budgets to increase its expenditure on R&D as suggested in the RDP (p92) in the next financial year.

The NIC must attract MNCs to invest in South Africa, and where possible develop co-operative agreements with them, so that South Africa may gain from their expertise and from technology transfer. The NIC should develop incentives for MNCs to locate and do business in South Africa.

The opinion of the survey respondents is that companies be given tax relief for R&D expenditure. The details of this would have to be planned with the Finance Ministry. Some suggestions are tax holidays, increased rates of depreciation on R&D hardware and software, and availability of venture capital for entrepreneurs.

The local software and IT service industries must be promoted by government. This can be done by ensuring telecommunications links are available to the companies, by granting tax incentives for the use of IT, by reducing import taxes on IT, and by allowing these companies to write software development off over one year. Recommend that the NIC investigates these options, and pursues the feasible ones.

Technology parks have worked well in other parts of the world, and the NIC should investigate the feasibility of promoting the existing two such parks, as well as the possibility of starting additional such parks.

5.2.4 Developing Communities

Research on ITPs highlighted the following community issues:

- Underdeveloped rural areas
- Development of Community Centres

The establishment of community centres, especially in rural areas, which offer a range of services to local communities should be a priority of the RDP. A priority of the NIC should be to ensure that these centres are provided with IT, probably in the form of local area networks, which are in turn linked to the national telecommunications infrastructure. The NIC should then encourage a local entrepreneur to purchase the IT. This entrepreneur should then be trained by the NIC to operate the IT, and to run the IT of the community centre as a business. By renting time to community organisations,

schools, shops, clinics, government offices, and other small businesses in the centre, a new small business would be created.

5.2.5 Developing our Public Service

Research on ITPs highlighted the following issues regarding the Public Service:

- Public Service IT is in a fragmented and duplicated state
- There is a lack of co-ordination or collaboration between departments with respect to IT
- There is a lack of information transfer between departments, and to the public

It is not the aim of this ITP to provide a detailed analysis and solution to the issues in the Public Service. This section aims to offer recommendations on improving the IT infrastructure of the Public Service.

A study of the Public Service's IT and telecommunications' requirements should be undertaken by the NIC in conjunction with all the departments, and the Department of Posts and Telecommunications. The study should have the following aims: to determine:

- Public Service IT human resources requirements
- Public Service telecommunications infrastructure requirements
- Common needs and applications within the Public Service
- and agree on a set of standards for information transfer

The IT human resources requirements will form part of the input to the NIC to determine more accurate targets of South Africa's IT educational requirements.
The telecommunications infrastructure requirements would be input into the telecommunications requirements project.

Common needs should preferably be served by common applications to reduce redundancies and duplication.

The standards for information transfer should be as open as possible to facilitate the transfer of information not only to other government departments, but also to businesses and private citizens. Information transfer will facilitate improved monitoring of social conditions and RDP progress.

5.2.6 Government Projects

Research on ITPs highlighted the existing governmental issues:

- No government appointed committee to oversee ITP
- Lack of accurate data and statistics on South Africa's IT endowment
- No summary of laws and policies which affect IT in South Africa
- South Africa has the opportunity to become the IT leader in Africa

Government needs to legislate a National IT Committee (NIC) into existence which reports directly to cabinet and has the following functions:

1. to co-ordinate IT education and training

2. to develop and promote the IT software and services industry
3. to support the Public Service in it's IT efforts
4. to implement, maintain, monitor, review and re-develop ITP at most every 5 years
5. to conduct an IT survey every 2-3 years for input into the new ITP
6. to advise government on legislation which affects IT
7. to identify, define and co-ordinate national IT ventures

The first function is to co-ordinate IT education and training. This will include a survey of educational and training requirements and capabilities in the IT industry. NIC should set up an IT educational sub-committee with the Department of Education, the National Training Board, academic institutions, and private sector representatives to study the results and advise on IT human resources planning, IT education requirements, IT education curricula, selection of computer-supported educational packages, teacher training, and other related issues. NIC must promote a system of lifelong interactive education and training. It must create public awareness of the importance and uses of IT.

The second function is to develop and promote the IT software and services industry. This may involve a) planning tax relief for R&D companies with the Ministry of Finance, b) investigating the establishment of technology "greenhouses". NIC must develop co-operative agreements with MNCs. The NIC must create a favourable entrepreneurial environment, and must advise on possible opportunities.

The third function is to support the Public Service's IT efforts. This would include the study mentioned in section 5.2.5. Interaction between members of the public and the Public Service must be encouraged. A national government information infrastructure should be developed so that any citizen anywhere can gain access to any government department.

The fourth function of the NIC is to implement an ITP. This ITP must then be maintained, monitored, and reviewed. The results from the various surveys, plus wide consultation with all stakeholders should then lead to a re-development of the ITP. No ITP should remain in force for longer than 5 years. The NIC should consider developing a regional ITP for Southern Africa with willing neighbouring states in the future.

An IT survey must be conducted every 2-3 years, to ensure accurate data and statistics are available for input into the new ITP.

The NIC must advise government on legislation which affects IT. The NIC must ensure that the information rights of all citizens are recognised and confidentiality protected. A policy for intellectual and industrial property rights must be developed, and legal instruments developed to ensure that government can and does respond correctly to requests for information, and maintain confidentiality. The NIC must get legislation passed to ensure that imported IT includes a commitment to educate and train local labour to use, maintain and extend IT.

The last function is to identify, define and co-ordinate national IT ventures, such as Copine, NHIS and so on.

As with any ITP, not everything can be done simultaneously (Dieu and Le, 1995,89), priorities need to be set by NIC of which aspect will be tackled first, second and so on.

5.3 THE NEXT STEP - BEYOND 2000

The constraints of this ITP were that it was developed without good historical information, and therefore could not be expected to remain current for more than a short period.

The next step is to develop the following ITP which should take South Africa into the next century. Work on this plan can commence as soon as all the surveys recommended are complete. Wide consultation with all relevant stakeholders is recommended.

The next ITP should be able to define precise IT human resources requirements, have well developed IT curricula, and be in a position to review the effects of recommendations made.

CHAPTER SIX SUMMARY AND CONCLUSIONS

"Prediction is very difficult, especially when you are talking about the future" Niels Bohr (1885-1962)

6.1 SUMMARY

The research began with the questions:

- Is there a role for government in exploiting IT to improve South Africa's economic and social structures?
- Which government policies and programs for IT could increase South Africa's international competitiveness?

A literature search revealed that IT Policies (ITP) was a method several countries, notably Singapore use to exploit IT to achieve economic growth (Yellan and Sanford, 1995, and Pek Hooi Soh and Ang, 1993). There are many factors which affect the success or otherwise of countries' economic efforts, and IT is but one of these. This dissertation focused on IT and IT Policies only.

The literature revealed a number of successes with ITPs such as Singapore and Chile (Perez, 1992), as well as indifferent results with ITPs such as Brazil (Roche, 1990). There were also successes without ITPs such as New Zealand (Kraemer and Dedrick, 1993a).

What made one country successful and another not as successful? Factors of competitiveness were examined, as well as frameworks to compare countries. A framework was selected and used to compare IT in five countries with the state of IT in South Africa.

A questionnaire for an opinion survey was developed in an attempt to validate the assumptions arrived at from the comparison. It was decided to target people who, in the authors view, might have an informed opinion on the subject of an ITP.

The results of the opinion survey were then analysed, and compared to the results obtained in the previous step. Similarities and conflicts between the two were extracted.

Conclusions drawn from examining the opinion data, the country comparisons, and case studies of countries, were then used both independently and together, to define a recommended ITP for South Africa.

6.2 THE RESEARCH FINDINGS AND IMPLICATIONS

A myriad of factors hinder South Africa's competitiveness, socio-economic factors being most significant. IT can influence and improve South Africa's competitiveness, but it cannot do it alone or in isolation.

The South African government needs to develop an ITP as a matter of urgency, in order to fully control the development of the country. Failure to do so will result in

overspending, a prospect South Africa should not have to deal with. If the South African government fails to implement an ITP, each province and government department will go their own way, resulting in duplicated, redundant and incompatible IT. The government cannot effectively monitor the social development and progress of the RDP with the current IT systems.

It is critical to develop South Africa's human resources, not only for the development of the IT industry, but for the continued development of the country. Human resources are a country's most valuable asset, yet they have been sadly neglected in South Africa. IT needs to be utilised as part of the solution to lift the people of South Africa, and, in so doing, increase the country's competitiveness and viability.

A successful IT policy must be international in focus, and must not attempt solely to protect local industry. The policy should target the software and services sectors of the IT industry, not the hardware manufacturing sector as growth figures suggest. IT Policies must be co-ordinated around strategic goals by a strong co-ordinating body that can compel action on the part of other agencies and the private sector.

6.3 ACHIEVEMENTS OF THIS STUDY

No evidence was found of any prior research which gathered the opinions of informed individuals on the subject of an ITP for South Africa. This study documented the views of opinion makers both in South Africa and internationally. The methodology used in the

study may have wider applicability, and can possibly be used by others as a benchmark for developing an ITP.

An analysis of the opinion survey results indicates an overall commitment to an ITP for South Africa. The majority of respondents (74%) felt that the South African government should develop a national ITP at this point in time.

6.4 CONCLUSIONS

An ITP would offer many benefits to South Africa if properly and quickly implemented. The extent to which an ITP can benefit South Africa is dependent on the commitment it receives from government, the support it obtains from the provinces, as well as on a number of uncontrollable socio-economic factors.

The rapid change occurring on all fronts in South Africa needs to be managed by the government through policies and procedures. IT is one of the fastest changing factors in today's world, and if left unmanaged, South Africa could find itself out of line with the rest of the world. The South African government needs an IT policy to manage IT for the country.

Unfortunately, there is no simple formula for implementing such a policy, nor is there time to spend on lengthy consultations defining such a policy. The data on IT and many other aspects in South Africa is found wanting. This study concludes that an interim policy, such as the recommended policy of chapter 5, should be implemented without

delay. One of the first actions in the recommended policy is to undertake a detailed survey to establish all the necessary facts to redevelop the policy as soon as possible.

An ITP, like any policy, is only viable when implemented correctly. Some of the issues such as telecommunications linkages are purely technical, but the main challenges arise when people are involved. People need to be given the correct education and training in order for an ITP to succeed.

6.5 FURTHER RESEARCH

The area of ITPs is still a relatively new area, particularly in Africa. Further areas for research include:

- A survey of educational and training requirements and capabilities for the IT industry in South Africa
- Development of curricula for IT in schools
- Development of teacher training courses to implement such curricula
- Development of public awareness program for IT
- An investigation into the viability and feasibility of technoparks
- A study of the Public Service's IT and telecommunications requirements
- An investigation to determine common needs and applications within the Public Service
- Development of a regional ITP for Southern Africa with neighbouring states
- A survey of all legislation which affects IT in South Africa

CHAPTER SEVEN BIBLIOGRAPHY

ANC: *"The Reconstruction and Development Programme"*, First Edition, Umanyano Publications, Johannesburg, 1994

Adam R; "*Science and Technology Green Paper - Preparing for 21st Century*", talk at National Information Technology Policy Conference, 22-23 November 1995, Fourways, South Africa

Avgerou C and Madon S; "Development, Self-determination and Information", *South African Computer Journal*, No.15, December 1995, pp 4-12

Baeza-Yates R A, Fuller D A and Pino J A; "Information Technology Landmarks in Chile: A Survey", *Information Technology for Development*, March 1995, pp 25-31

Bagga R.K. and Veena, "Human Resource generation in Information Technology - Indian effort", Ed Duncan K & Krueger K, IFIP Transactions, *Linkage and Developing Countries*, North-Holland, 1994, pp 109 - 114.

Bakker B; "Local can be lekker", *I.T. in the new South Africa*, Editor Heydenrych F, Computerweek, Johannesburg, 1994, p 89

Benjamin P: "*People Empowerment: Investing In Human Resources, Education And Training For The Global Information Society", G7* paper for SANCO Core Group, from "peter@wn.apc.org" 12 Feb. 1996

Bharali U., "Meeting Communication Technology Needs for DC's: A case for partnership in technology development", Ed Duncan K & Krueger K, IFIP Transactions, *Linkage and Developing Countries*, North-Holland, 1994, pp 489 - 495.

Bidoli M and Laing R; "Mandela appeals to fairness", *Financial Mail*, October 13, 1995, pp24-28

Bishop J M; "The Status of Computing Manpower and Training in Tertiary Education in Southern African Universities 1995", Report 95/02, October 1995, *University of Pretoria*

Bjorn-Anderson N; "*National IT Policies*", Talk at CISNA 1994 in Cape Town

Blake E; "Information Technology Research in Support of the Reconstruction and Development programme", talk and paper at *National Information Technology Policy Conference*, 22-23 November 1995a, Fourways, South Africa, pp 1-4

Blake E; "*Night thoughts on the information society*", from CSSA Digest, 18 Feb. 1996 01:29:02 +0200 (SAT)

Boon JA, Britz JJ and de Lange M; "Size of the Information Sector in South Africa", *South African Journal Library Information Sciences*, 1993, 61, pp109-123

Bornman J; "Computas huh?", *Information Technology Review*, Vol. 2, No. 11, November 1995, pp30-31

Boscheck R; "Competitive Advantage: Superior Offer or Unfair Dominance?", *California Management Review*, Vol. 37, No. 1, Fall 1994, pp132-151

Braa J and Heywood A; "South Africa, Africa and Health Information systems - The need for a Reciprocal Collaboration", in '*Health Information Society and Developing Countries*' Editors M Sosa-Iudicissa, J Levett, S Mandil, PF Beales, IOS press 1995, pp2-12

Braa J, Monteiro E and Reinert E S; "Technology transfer vs. Technological Learning; IT-infrastructure and Health Care in Developing Countries", *Information Technology for Development*, 6, 1995, pp 15-23

Braa J and Power M; "Information Technology, development and Health", *IT for Development Conference*, 6-7 July 1995, Witwatersrand University, pp134-141

Branscomb L M; "Does America Need a Technology Policy?", *Harvard Business Review*, March-April 1992, pp 24-31

Brauer GW; "The future of Information Technology for Health care in Developing countries: An examination of some problems", Ed Brunnstein K and Raubold E, IFIP *Transactions, Applications and Impacts*, North Holland, 1994, pp 509-516

Business Africa: "The South Africa budget: good in parts", *Business Africa*, April 1- 15, 1995, p2

Cape Times, 27/2/96, two articles, *Cape Times*, 1996

Chiang J; "Technology Policy Paradigms and Intellectual Property Strategies: Three National Models", *Technological Forecasting and Social Change*, Vol. 49, No. 1, May 1995, pp 35-48

Christie K; "Singapore Progress versus Democracy", *Indicator South Africa*, Vol. 12, No. 4, spring 1995, pp 73-76

Clarke K; "Window Shopping", *South African Decisions*, published by Harrington Kilbride, editor Spence A, 1994, pp 40-45

Clarke R: "Information Technology: weapon of authoritarianism or tool of democracy?", Ed Brunnstein K, Raubold E. IFIP Transactions, *Applications and Impacts*, North-Holland ,1994, pp 588-596.

Coates J F; "What to Do When You Don't Know What You Are Doing", *Technological Forecasting and Social Change*, Vol. 48, No. 1, January 1995, pp 249-252

COPINE, "Copine: A cooperative information network linking scientists, educators, professionals and decision makers in Africa", Prepared by *United Nations Programme on Space Applications*, June 1995

Crossman TE, Fortmann P, Heneke V, Murray D: "Information technology in a Developing Economy", *South African Computer Journal*, No.15, December 1995, pp13-19

Cyranek G., "Information Technology Assessment in Developing Countries: The forgotten part of technology transfer", Ed Duncan K & Krueger K, IFIP Transactions, *Linkage and Developing Countries*, North-Holland, 1994, pp 471 - 476.

DACST, Department of Arts, Culture, Science and Technology; "A Technology Foresight Programme for South Africa, Discussion Document", *DACST*, May 1995, pp 1-11

Davis C, Tiffin S and Osotimehin; "Developing capacity in management of science, technology and innovation in Africa", *International Journal of Technology Management*, Vol. 9, No. 1, 1994, pp 43-60

Dedrick J, Goodman S E and Kraemer K L; "Little Engines that could: Computing in Small Energetic Countries", *Communications of the ACM*, May 1995, Vol. 38, No. 5, pp 21-26

Dedrick J and Kraemer K L; "Caught in the Middle: Information Technology Policy in Australia", *The Information Society*, Vol. 9, pp 333-363, 1993.

Dedrick J and Kraemer K L; "National Technology Policy and Computer Production in Asia-Pacific Countries", *The Information Society*, Vol. 11, No. 1, 1995, pp 29-58

den Hertog P, Fahrenkrog G: "IT Adoption: Can Policy Help? Experiences and Trends in Five EC Member States", *IDATE 15th International Conference*, Montpellier, France, November 26, 1993

de Woot P; "*High Technology Europe. Strategic Issues for Global Competitiveness*", Basil Blackwell, Oxford, 1990

Dieu P D and Le N H; "Vietnam's IT-2000 Program: The Challenges Ahead", *Information Technology for Development*, September 1995, pp 85-94

Du Toit M: "Vital to develop one consistent strategy", *I.T. in the new South Africa*: Editor Heydenrych F, Computerweek, Johannesburg, 1994, pp 47-49

Ein-Dor P, Myers M D and Raman K S; "Information Technology in Three Small Developed Countries", unpublished report *Tel Aviv University*, November 1994, pp 1-41

Flood R L: "Progressive Social Change: a Critical Systems Perspective" *International Conference on Systems Thinking and Progressive Social Change*, University of Cape Town, September 1994, pp74-78

G7 Pilot Projects, off *Internet* location http://www.ispo.cec.be/g7/projidx.html, 1 Feb 1995

Goodchild N; "*Information A National resource and Asset for Development*", talk at National Information Technology Policy Conference, 22-23 November 1995, Fourways, South Africa

Goodman S E; "Computing in South Africa: An End to 'Apartness'?", from *Communications of the ACM*, February 1994, Vol. 37, No. 2, pp 21-25

Gore A Jr; "Information and Society: Keynote Address to the G7 Ministerial Conference, 25-26 February 1995, Brussels", Advanced Technology Assessment System, Issue 10, Autumn 1995, *United Nations Conference on Trade and Development*, Division for Science and Technology for Development, Geneva, pp 3-6

Grobler M; "Computer-supported Cooperative education to Support Development in South Africa", *South African Computer Journal*, No.15, December 1995, pp26-35

Hanna N; "Government Policies and Strategies for the Software Industry: The Case of India", *Advanced Technology Assessment System*, Issue 10, Autumn 1995, United Nations Conference on Trade and Development, Division for Science and Technology for Development, Geneva, pp 523-526

Hanna N and Dugonjic; "why a National Strategy for Exploiting Information Technologies", *Advanced Technology Assessment System*, Issue 10, Autumn 1995, United Nations Conference on Trade and Development, Division for Science and Technology for Development, Geneva, pp 32-47

Handy C; "*The Empty Raincoat, Making Sense of the Future*", Hutchinson, London, 1994

Harfoush N, Wild K: "National Information Management Project. South Africa", *A Report by The International Development Research Centre*, Johannesburg, 1994

Harindranath G; "Information Technology Policies and Applications in the Commonwealth Developing Countries: An Introduction", in *"Information Technology Policies and Applications in the Commonwealth Developing Countries"*, Editors Harindranath G & Liebenau J, The Commonwealth Secretariat, 1993

Hartley R; "The minister of lights, action and laughter", *Sunday Times*, March 24 1996, p19

Heydenrych F; "IT Could Help Halt the Slide", *I.T. in the new South Africa*, Editor Heydenrych F, Computerweek, Johannesburg, 1994, pp 5-6

Heymans C; "A Lifelong Task The RDP in Perspective", *Indicator South Africa*, Vol. 13, No. 1, Summer 1995, pp 57-64

Hookes D and Brick W; "New Technology and the Political Economy of Development", *Coventry University, 1993*

Hunt M; "Introduction to the Design of Questionnaires", *University of Loughborough*, August 1995, http://www.leeds.ac.uk/ucs/docs/beg19/beg19.html

IT Review; Vol.3 No.2 March 1996, various articles

Jackson C; "Statistics on Information Technology in New Zealand", from *http://www.govt.nz/ps/min/com/it95/*, IT Policy Unit, Ministry of Commerce, 1995a

Jackson C; "New Zealand Information Infrastructure Policy", from *http://www.govt.nz/ps/min/com/it95/*, IT Policy Unit, Ministry of Commerce, 1995b

Johnston K A and Miller J; "Should African Governments play a role in Computerisation?", *Fifth CISNA Conference*, July 1994, Cape Town, pp 59-65

Jordan P: "Universal Service a Prime Goal for South Africa", *I.T. in the new South Africa*: Editor Heydenrych F, Computerweek, Johannesburg, 1994, pp 42-45

Kelly T; "Defining Performance Indicators for a Post Apartheid South Africa", *Telecom and Development TFA*, pp 125-132, 1994 - (in O5)

Kennedy S; "Business Process Reengineering and Change Management", *UCT Centre for Information Systems*, September 1995, pp 1- 64

Kenney G I; "The Missing Link - Information", *Information Technology for Development*, March 1995, pp 33-38

Klein M; "Survey finds South Africa's competitiveness drops as its competition grows", *Business Times supplement to Sunday Times,* 19 November 1995, page 33 of Business Times.

Koning H A, Blees S W: "Looking at unsatisfied demand in South Africa", in "*Telecommunications and Developments in Africa*", Editors Kiplagat B A & Werner M C M, 1994, pp 133-143

Korpela M: "Who Will Implement Technology for Development?", *South African Computer Journal*, No.15, December 1995, pp20-25

Kraemer K L and Dedrick J; "Turning Loose the Invisible Hand: New Zealand's Information Technology Policy", *The Information Society*, Vol. 9, pp 365-390, 1993a.

Kraemer K L and Dedrick J; "Industry Coordination as a Problem in National Information Technology Policy: The Case of the Philippines", *Centre for Research on Information Technology and Organisations (CRITO)*, Irvine, 1993b, pp 1-30

Kraemer K L and Dedrick J; "Payoffs from Investment in Information Technology: Lessons from the Asia-Pacific Region", *World Development*, Vol. 22, No. 12, pp 1921-1931, 1994a

Kraemer K L and Dedrick J; "From Nationalism to Pragmatism: IT Policy in China", *IEEE Computer 1995*, pp 64-73

Kraemer K L, Gurbaxani V and King J L; "Economic Development, Government Policy, and the Diffusion of Computing in Asia-Pacific Countries", *Public Administration Review*, March/April 1992, Vol. 52, No. 2, pp 146-156

Lebre La Rovere R. "Information Technologies in the Brazilian Services Sector: Diffusion and impacts on competitiveness", Ed Duncan K & Krueger K, IFIP Transactions, *Linkage and Developing Countries*, North-Holland, 1994, pp 71-75.

Lepowski W: "Policy issues permeate efforts to create information infrastructure", *Chemical & Engineering News (CEN)*, Vol:73 Iss: 13 Date: Mar 27, 1995 p: 72-76

Malan J; Interview with Johan Malan Director *Technopark Stellenbosch*, 18/3/96

Miller J; "Towards a National IT Policy for South Africa", unpublished paper *University of Cape Town*, 1994a

Miller J; "Does South Africa need a National Information Technology Policy?", unpublished article, *University of Cape Town*, 1994b

Miller J, Blake E and Webber R; "Response to the Green Paper on Science and Technology", Prepared for the *Interim Steering Committee of the National Information Technology Forum*, Feb 1996

Mohr P J, Botha Z C, Inggs E J and van der Merwe C; "*The Practical Guide to South African Economic Indicators*", Lexicon Publishers, Johannesburg, 1995

Moikangoa N, Fouche B and Cogburn D L; "The Information Technology Revolution and Structural issues in South Africa: Towards a framework for the 'Governance' of Information Technology" Paper at *National Information Technology Policy Conference*, 22-23 November 1995, Fourways

Monsieur M: "I.T. a Necessity, not a Luxury", *I.T. in the new South Africa*: Editor Heydenrych F, Computerweek, Johannesburg, 1994, pp 13-24

Montviloff V; "Implementation of Policies for the Application of Information Technologies", *Advanced Technology Assessment System*, Issue 10, Autumn 1995, United Nations Conference on Trade and Development, Division for Science and Technology for Development, Geneva, pp 442-447

Mullin J, Ashley D, Odhiambo T, Makhubu L, Oldham G; "Towards A Science and Technology Policy for a Democratic South Africa", by a Mission sponsored by *The International Development Research Centre (IDRC)*, Canada, December 1992

Munasinghe M; "Policy and Infrastructure for Information Technology", *Advanced Technology Assessment System*, Issue 10, Autumn 1995, United Nations Conference on Trade and Development, Division for Science and Technology for Development, Geneva, pp 476-486

Naidoo J; "Bridging chasm to create one South Africa", *Sunday Times*, February 11 1996, p24

NCLC, "Framework For A National Information Technology Strategy For South Africa", *NCLC*, March 1994

Nidumolu S R and Goodman S E; "Computing in India: An Asian Elephant Learning to Dance", *Communications of the ACM*, June 1993, Vol. 36, No. 4, pp 15-22

NITF Draft Constitution, 15 August 1995a, *NITF*, pp1-14

NITF Draft Terms of Reference, 20 December 1995, *CSSA Digest Number 96*

Odedra M: "IT Policies in the Commonwealth Developing Countries", in *"Information Technology Policies and Applications in the Commonwealth Developing Countries"*, Editors Harindranath G & Liebenau J, The Commonwealth Secretariat, 1993a, pp 9-35

Odedra M, Lawrie M, Bennett M and Goodman S; "Sub-Saharan Africa: A Technological Desert", from *Communications of the ACM*, February 1993, Vol. 36, No. 2, pp 25-29

OECD , "*Technology and the Economy. The Key Relationships*", published by the Organisation for Economic Co-operation and Development (OECD), Paris, 1992

Pek Hooi Soh, Ang J: "The Role of the Singapore Government in National Computerisation" Editor Whitley E A, *Proceedings of the First European Conference on Information Systems*, Henley on Thames, 1993, pp 39-47.

Perez V L; "Developing informatics policies", *Information & Management* 23, 1992, pp 7-14

Quelch J A and Austin J E; "Should Multinationals Invest in Africa?", from *Sloan Management Review*, Spring 1993, pp 107-119

Reinecke I; "Clients First the challenge for the Government information technology", 1 March 1995, on *Internet* "http://www.nlc-bnc.ca/ifla/services/infopol.htm"

Roche E M: "Brazilian Informatics Policy: The High Costs of Building a National Industry", in *Information Society* Volume 7 , 1990, pp 1-32

Roche E.M. and Blaine M., "Public Policy and Information Technology in the Developing World: Difficult financial options", Ed Duncan K & Krueger K, IFIP Transactions, *Linkage and Developing Countries*, North-Holland, 1994b, pp 483 - 488.

Ryan C; "Deep Pockets", *South African Decisions*, published by Harrington Kilbride, editor Spence A, 1994, pp 21-24

Sergeant M; "Govt set to upgrade systems", *Business Day*, 9 November 1995, p24

Skweyiya Z: "IT Can Expand the Frontier of Human Performance", *I.T. in the new South Africa*: Editor Heydenrych F, Computerweek, Johannesburg, 1994, pp 66-67

Smith C; "Found Wanting", *Finance Week*, March 30 - April 5, 1995, Vol.64, No.13, pp26-27.

Smith C; "Rapid Development...the RDP finally takes off and becomes the pilot for Mandela's National Strategic Vision", *Finance Week*, February 1-7, 1996, pp28-30

Song S and Akhtar S; "Communication for Reconstruction and Development: The Information Highway as Basic Infrastructure in the New South Africa", *Information Technology for Development*, September 1995, pp 53-65

Spier A; "Harnessing IT for Development - Current IT Trends on the Competitiveness of Developing Countries", paper at *National Information Technology Policy Conference*, 22-23 November 1995, Fourways, South Africa, pp 1-8

S&T Green Paper; South Africa's Green Paper on Science and Technology, *Department of Arts, Culture, Science and Technology*, Jan 1996, http://wn.apc.org/technology/stgreen.html

Talero E: "A Demand Driven Approach to National Informatics Policy", Ed Duncan K & Krueger K, IFIP Transactions, *Linkage and Developing Countries*, North-Holland, 1994, pp 17-25

Telecom Africa Bulletin, Published in Belgium by Telecommunications Foundation of Africa, Vol.3, No.3, 15 November 1995, pp1-12 , articles on Telecon 95 and Africa, Internet and Africa, G7

Telecommunications Green Paper, Location: http://wn.apc.org/technology/telecoms/facts.htm 1 Feb. 1996

Thahane T T, Amin H: "Technological and Communications Revolution: a Critical Dimension of Development" Ed Brunnstein K, Raubold E. IFIP Transactions, *Applications and Impacts*, North-Holland, 1994, pp 205-212.

Tolentino P E E; "*Technological Innovation and Third World Multinationals*", Routledge, London, 1993

Viehland D W, India's New Software Powerhouse, *Infosys* V3 N4; Feb. 12 1996

Vietnam: "Policy on Information Technology Development in Vietnam up to 2000", *Vietnam's Ministry of Science, Technology and Environment*, 1993.

Woherem E E; "Towards a Culture of Maintenance of Software Systems Maintenance in Africa", *Information Technology for Development*, March 1995, pp 5-14

Wood G: "The role of Information Technologies in New South Africa", Unpublished Rough draft , *University of Arizona*, December 1993, pp 1 -58.

Woodward J Editor; "*Pictorial Atlas of The World*", C Struik, Cape Town, 1988

"*World Competitiveness Report 1994*", published by International Institute for Management Development (IMD), Lausanne, Switzerland

"*World Competitiveness Report 1995*", published by International Institute for Management Development (IMD), Lausanne, Switzerland

Yellen R E and Sanford CC; "Lessons From Singapore: A Model for Emerging Countries to Achieve Quality Economic Growth", unpublished, *University of North Texas*, April 1995, pp 1- 14

CHAPTER EIGHT GLOSSARY OF TERMS AND ACRONYMS

ABE	Adult Basic Education
COPINE	A Co-operative Information Network Linking Scientists, Educators, Professionals and Decision Makers in Africa - United Nations
CSIR	Council for Scientific and Industrial Research - South Africa
CSSA	Computer Society of South Africa
CNC	Committee on National Computerisation - Singapore
DACST	The Department of Arts, Culture, Science and Technology in South Africa
DC	Developing Country
DTI	The Department of Trade and Industry - South Africa
DUCSA	Digital Utility Corporation for South Africa
ECOM	National Computing Centre - Chile
ESCOM	Electricity Supply Commission - South African parastatal
GATT	General Agreement on Trade and Tariffs
GDP	Gross Domestic Product
GNP	Gross National Product
IDRC	International Development Research Centre - Canada
ITNQF	Information Technology National Qualifications Framework - South Africa
IT	Information Technology
ITP	Information Technology Policy
ITUC	Information Technology Users Council - South Africa

MNC	Multi National Company
NCB	National Computer Board - Singapore
NCLC	National Computer Liaison Committee - South Africa
NHIS	National Health Information System
NIC	National IT Committee - created by author for ease of reference
NITF	National Information Technology Forum - South Africa
OECD	Organisation for Economic Co-operation and Development
RDP	Reconstruction and Development Programme
R&D	Research and Development
S A	South Africa
SANDF	South African Defence Force
SOL	Students On Line - UNISA project
Telkom	Telecommunications parastatal - South Africa
Transtel	Telecommunications subsiduary of Transport parastatal - South Africa
UNISA	University of South Africa
WCR	World Competitiveness Report

Matrix comparing various countries

	SOUTH AFRICA	SINGAPORE	NEW ZEALAND	AUSTRALIA	INDIA	BRAZIL	CHILE
ENVIRONMENT							
Area in square kilometres	1,233,404	625	267,800	7,686,848	3,166,829	8,511,965	756,626
Raw Materials	Gold, diamonds		Energy, coal	Minerals	Coal, Iron	Iron	Copper, Iron
POLITICAL ENVIRONMENT							
Type of government	Demo Fed	Authoritarian	Democratic	Demo Fed	Demo Fed	Democratic	Democratic
Government ranking WCR '95	38	1	3	9	30	25	10
Freedom of Press	Yes	No	Yes	Yes			
ECONOMIC ENVIRONMENT							
GDP in US$ billions '94	127.6	69	50	323.9	258	468.3	48
GDP per capita in US$ '94	3,158	23,619	14,146	17,995	289	2,990	3,492
Unemployment % '94	48	2.6	8.1	9.7			6
Inflation rate '94	9	4.5	1.6	1.6	11	2300	8.9
Gross domestic save as % '93	17.5	48.3	19.4	16.5	22	21	28.75
Finance ranking WCR '95	20	1	10	16	30	37	15
Domestic Economic Strength W	42	2	22	23	28	44	11
Internationalisation WCR '95	43	2	23	31	40	36	16
Highest tax rate '95	45%						
IT INFRASTRUCTURE							
IT spending relative to GDP '91		3	3.5				
% of computers in world '93	0.25	0.2	0.29	1.98	0.37	0.62	
No. computers installed	1,200,000	409,080	430,580				
First computer installed	1957	1964					
Computers per capita '93	0.01	0.125	0.148	0.193	0.001	0.007	0.086
Infrastructure ranking WCR '95	19	12	6	4	43	37	22
Venture capital	Poor		Poor	Poor			
Percentage Information workers	5.84	10	4.8				

	SOUTH AFRICA	SINGAPORE	NEW ZEALAND	AUSTRALIA	INDIA	BRAZIL	CHILE
HUMAN RESOURCES							
Infant Mortality rate per 1000 '92	53					57	17
Population in millions '93	40.5	2.86	3.44	17.7	890	159.4	13.6
Population growth % '85-93	3.16	1.39	0.71	1.44	2.15	2.05	1.45
Official Language(s)	Eleven, including English	English,Mandarin,Chinese, Malay	English,Maori	English	Hindi,English	Portuguese	Spanish
Secondary school enrolment % '91		71	84	86			
Number of Universities '95	21	6	7				
Adult illiteracy % '94	21.8	13.9	1.5	1	51.8	18.9	6.6
People ranking WCR '95	48	1	12	16	47	35	23
Management ranking WCR '95	35	5	6	19	39	32	9
Life expectancy '92	63					66	72
SCIENCE, TECHNOLOGY, R&D							
Scientists & engineers % '92	54.5	57.2	54.6	62	41.1		53
R&D as % of GDP '92	0.94	0.88	0.88	1.34	0.88		0.7
Total expenditure on R&D US$	1007	178	372	3974	2495		220
Science & Technology ranking '9	28	10	22	20	35	29	27
Tax incentives for R&D	Nil						
Technology Parks	Two	One	One				
TELECOMMUNICATIONS							
Telephones per 1000 '93	95.3	383.3	447.2	486	7.8	69.7	89.2
Telecomms infrastructure rankin	21	1	2	11	36	26	13

Questions	ACADEMIC					BUSINESS										GOVERNMENT								OPINION	
	A	B	C	D	E	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Yes	%
1. Should the South African Government develop a National IT Policy at this point in time? Yes /No	N	?	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	17	74%
2. Is IT an industry in which South Africa can achieve international competitive advantage? Yes /No	N	?	Y	?	?	Y	Y	N	Y	N	Y	Y	N	N	Y	?	Y	N	N	Y	Y	Y	Y	12	52%
3. To have a successful IT Policy, Government must balance its IT and other policy options? Agree / Disagree	A	A	A	A	A	A	D	A	A	A/A	A	A	A	A	A	A	A	A	A	A	D	A	A	20	87%
4. Is IT an industry which could create international competitive advantage in other economic sectors in South Africa? Yes /No	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	22	96%
5. Should Government provide opportunity for consultation when drawing up an IT Policy? Yes /No	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y/	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	20	87%
6. If your answer to previous question was 'yes', with who? If your answer was no, why not?																									
7. Should South Africa promote IT co-operation with neighbouring states in Africa? Yes /No	N	?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	?	Y	Y	Y	Y	Y	Y	N	18	78%
8. Is IT productivity in South Africa better than the overall productivity in the country? Yes /No	N	?	N	?	?	N	Y		Y	Y/	Y	Y	Y	Y	?	?	N	N	N	?	?	Y	N	7	30%
9. How should South Africa increase its IT competitiveness?																									
Deregulation of Industry	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y	21	91%
Free Trade Agreements		Y	Y		Y	Y		Y	Y	Y			Y	Y	Y		Y	Y	Y	Y	N	Y	Y	16	70%
Tax Reductions			Y		Y	Y	Y	Y	Y	Y	Y	Y	Y		Y			Y	Y	Y			Y	15	65%
10. Should IT be taught in high schools? Yes /No	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	21	91%
11. What percentage of GDP should Government spend on R&D?																									
0 to 0,49%						Y	Y										Y		Y					4	17%
0.5 to 0,99%												Y						Y						2	9%
1 to 2%				Y	Y									Y								Y		4	17%
Greater than 2%.	Y	?							Y							Y				Y			Y	5	22%
12. Should Companies be given tax relief for IT R&D expenditure? Yes /No	Y	Y	Y/	N	Y	N	Y	Y	Y		Y	Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	Y	16	70%
13. Should legislation be passed to ensure overseas companies spend a certain proportion of local turnover on co-operative R&D projects? Yes /No	Y	?	N	?	?	N	Y	Y	Y		N	Y/	N	N	Y	N	N	Y	N	Y	N	N	Y	8	35%
14. Should Government generate a demand for IT? Yes /No	Y	?	Y	N	Y	N	Y		Y		N	Y	Y	Y	Y	Y	N	Y	N	N	N	N	Y	12	52%
15. How could the Government generate a demand for IT?																									
Push IT in Public Sector	Y	Y	Y	Y	Y							Y		Y		Y	Y	Y	Y	Y		Y	Y	14	61%
Popularise IT culture		Y	Y		Y						Y			Y		Y	Y	Y	Y	Y	Y	Y	Y	13	57%
Tax Reductions	Y	Y	Y		Y		Y					Y	Y			Y			Y	Y				10	43%

Questions	ACADEMIC A	B	C	D	E	BUSINESS G	H	I	J	K	L	M	N	O	P	GOVERNMENT Q	R	S	T	U	V	W	X	OPINION Yes	%
16. Should the Government allow companies to compete with Telkom?																									
Yes /No	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	22	96%
17. Should legislation be passed to ensure that imported IT includes a commitment to educate and train local labour to use, maintain and extend the technology?																									
Yes /No	Y	?	N	Y	Y	Y	Y	Y	Y		N	N		N	Y	Y	Y	Y	N	Y	N	N	Y	13	57%
18. How could IT improve the distribution of economic and social benefits in SA?																									
Job enrichment			Y	Y	Y			Y			Y		Y	Y			Y	Y	Y	Y	Y	Y		13	57%
National Health Information System			Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y				Y		Y	Y			14	61%
Accurate Statistics on SA			Y		Y			Y	Y		Y	Y	Y	Y				Y		Y	Y			11	48%
National Welfare System			Y		Y	Y		Y	Y		Y		Y	Y				Y		Y	Y			11	48%
Access to Information	Y		Y	Y	Y			Y			Y		Y	Y		Y	Y	Y	Y		Y	Y	Y	15	65%
19. How could IT transform the quality of government client service to the people?																									
Faster turnaround		Y	Y	Y	Y		Y	Y			Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	18	78%
Accurate on-line information	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	21	91%
Access to Information	Y	Y	Y	Y	Y	Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	21	91%
20. Should Government start a 'Buy South African' campaign in terms of IT?																									
Yes /No	N	N	Y	N	N	N	N	N	Y		N	Y	N	Y	N	N	Y	N	N	Y	N	N	N	6	26%
21. Should Government promote a local IT industry?																									
Hardware	Y					N			Y		Y		Y	Y			N	Y		Y	N	Y		8	35%
Software	Y		Y		Y	N	Y	Y	Y		Y	Y	Y	Y	Y		N	Y		Y	N	Y	Y	15	65%
Services	Y		Y	Y	Y	N	Y	Y	Y		Y	Y	Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	18	78%
22. Should Government provide incentives for Multinational IT companies to do business in SA?																									
Yes /No	Y	?	Y	Y	N	Y	Y	N	N		Y	Y	Y	N	N	Y	Y	Y	N	N	N	N	Y	12	52%
23. Which Government department(s) should be in charge of a National IT Policy? (Enter name of Department(s))	Technology					IT			S&T		Inter-dept				IT	Public Service Public Admin.									
24. Should SA have a National Health IT system?																									
Yes /No	Y	?	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y		N	Y	N	Y	Y	?	?	Y	Y	16	70%
25. Provinces /Government departments creating their own IT Policies could result in:																									
Competitiveness		Y	Y		Y								Y										Y	5	22%
Duplication	Y	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y	Y	Y	Y		Y		19	83%
Incompatibility		Y	Y	Y		Y	Y	Y	Y		Y	Y		Y	Y		Y	Y	Y			Y		15	65%
Innovation		Y	Y				Y		Y		Y			Y									Y	7	30%
Redundancy	Y	Y	Y		Y	Y	Y	Y			Y	Y	Y	Y	Y			Y	Y	Y		Y		16	70%
26. Each Province / Government department should be free to develop its own IT Policy, co-ordinated by a National IT Agency.																									
Yes /No	N		Y	N	Y/N	N	Y	Y	Y		N	Y	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y	13	57%
27. Should the Government take initiatives to enhance the competitiveness of Small Businesses?																									
Yes /No	Y		Y	Y	Y	Y	Y	Y	N		Y	N	Y	Y	N	Y	N	Y	N	Y	N	Y	Y	15	65%
28. What sort of initiatives could Government take to enhance the competitiveness of Small Businesses?																									
Technological development		Y	Y				Y	Y			Y		Y	Y		Y	Y	Y		Y	Y	Y	Y	14	61%
Knowledge Acquisition	Y	Y	Y				Y	Y			Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	16	70%
Training	Y	Y	Y	Y		Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	19	83%

Questions	ACADEMIC					BUSINESS									GOVERNMENT								OPINION	
	A	B	C	D	E	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Yes	%
29. What items should be covered by a National IT Policy?																								
National IT Committee	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y	Y		Y			Y	Y	18	78%
Government Ministry responsible for IT		Y	Y	Y		Y	Y	Y	Y				Y	Y	Y	Y	Y		Y			Y	Y	15	65%
Technological development	Y	Y	Y		Y		Y	Y			Y	Y	Y	Y	Y	Y	Y					Y	Y	15	65%
Knowledge Acquisition	Y	Y	Y		Y	Y	Y	Y			Y		Y	Y	Y	Y	Y						Y	14	61%
Education and Training	Y	Y	Y	Y	Y		Y	Y	Y		Y		Y	Y	Y	Y	Y						Y	15	65%
Research and Development	Y	Y	Y	Y	Y		Y	Y	Y		Y		Y	Y	Y	Y	Y					Y	Y	16	70%
Technology Transfer	Y	Y	Y	Y	Y		Y	Y			Y		Y	Y	Y	Y	Y	Y				Y	Y	16	70%
International co-operation		Y	Y	Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	Y		Y					Y	15	65%
Protection of Intellectual property		Y		Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y							Y	14	61%
IT Industry development		Y	Y		Y		Y	Y			Y		Y	Y	Y	Y						Y	Y	12	52%
Data Communications	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y			Y	Y	18	78%
Standards		Y		Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	17	74%
Government Application Projects		Y		Y	Y		Y	Y	Y			Y	Y	Y	Y	Y							Y	12	52%
Policies for promoting IT		Y	Y	Y	Y		Y	Y			Y	Y	Y	Y	Y	Y						Y	Y	14	61%
Small Business		Y	Y		Y	Y	Y	Y			Y		Y	Y	Y	Y		Y					Y	14	61%
Multi-National Corporations		Y	Y		Y		Y	Y			Y	Y	Y	Y	Y	Y							Y	12	52%
Regular Review of IT Policy	Y	Y	Y	Y	Y		Y	Y			Y	Y	Y	Y	Y	Y	Y					Y	Y	16	70%
IT in Public Sector	Y	Y	Y	Y	Y	Y	Y	Y				Y	Y	Y	Y	Y	Y	Y	Y			Y	Y	18	78%
Reform of Health services	Y	Y		Y	Y		Y	Y	Y			?	Y	Y	Y	Y							Y	12	52%
Universal telecommunications access	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y	Y	Y	Y	Y		Y				Y	17	74%
Taxes, tariffs, customs duty, surcharge etc.		Y			Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y							Y	13	57%
IT in Schools	Y	Y		Y	Y	Y	Y	Y			Y	Y	Y	Y	Y	Y	Y	Y					Y	16	70%
Statistics		Y			Y	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y							Y	13	57%
30. Are Benefits of developing a National IT Policy desirable?																								
Yes /No	Y	Y	Y	Y	Y	Y	Y		Y/		Y	Y	Y	Y	Y	Y	N	Y	Y	Y	?	Y	Y	18	78%
31. Is a National IT Policy the correct way of achieving these benefits?																								
Yes /No	Y	Y	Y	Y	Y	Y	Y		Y		Y		Y	Y	Y	Y	N	Y	Y	Y	N	Y	Y	18	78%
32. IT is a source of political, economic, social and cultural power that tends to prop up already powerful groups in society.																								
Yes /No	N	Y	Y	Y	Y	N	Y		Y		N	N	N	N	Y	N	Y	N	N	N	Y	N	N	9	39%
33. Please add any comments and/or issues																								
34. Do you wish to receive a summary of the findings of this research?																								
Yes /No	Y	N	Y	Y	Y	Y	Y		Y		Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	20	87%
35. Has your Department developed its own IT Policy, or does it intend to do so within the next two to three years?																								
Yes /No																	Y	Y	Y			Y	Y	5	63%
36. Would / did your Department consider other Departments when developing its own IT Policy?																								
Yes /No																	Y	Y	Y			Y	Y	5	63%
37. If your answer to the previous question was 'yes', which other departments were considered or consulted, and why?																								
(Enter name of Department(s))																Provincial Agric, State Expenditure								
																PSC, Land affairs, Local Govt								
																Land Affairs, Health, Transpor								
																Education								
																Provinces								

UNIVERSITY OF CAPE TOWN

Department of Information Systems

Leslie Commerce Building
Engineering Mall · Upper Campus
OR Private Bag · Rondebosch 7700
Tel: 650-2261
Telex: 57-21439
Tel. Add.: ALUMNI, Cape Town
Fax No: (021) 650-4085

21 February 1996

Dear Sir,

Information Technology Policy Survey

The purpose of this letter is to invite you to participate in an Opinion Survey I am conducting among key opinion makers in this country.

Many countries have implemented, or are considering implementing, National Information Technology Policies. For the purposes of the survey, an Information Policy is defined to be: "a programme of action that a Government defines to maximise the benefits of Information Technology (IT) in the country it governs. IT policies emphasise the skills and facilities required to process information. They can also look at what data should be collected, who should have rights to access such data, and the preservation of the integrity of the data."

The term "Information Technology" (IT) will be taken to mean all computer and telecommunications equipment (hardware), as well as the programs and applications (software), and the information manipulated thereon. Procedures and people in the IT industry are also included.

The IT status of several countries has been compared and applied to South Africa to gain fresh insight and to understand policy alternatives. In order to better understand the issues in a South African context, and to contribute to the debate, I am conducting the survey amongst 30 key opinion makers.

The survey will be used to obtain your perceptions of various issues, and will allow you to add any further issues that you believe are important. The 37 questions should not take you more than 30 to 45 minutes to complete. This survey is part of a research project being undertaken as part of the requirements for the degree of Master of Commerce in Information Systems at the University of Cape Town. I have 19 years experience in the IS industry, and am currently an IS Manager and a vice president of the Computer Society of South Africa.

Please complete and either fax or e-mail your opinions directly back to me, Kevin Johnston, by the 8th March 1996. The first page of the questionnaire has been set-up as a fax header for your convenience.

Thank you for taking the time to read this letter. As a key opinion maker your participation in the survey would be of great value. I would be pleased to provide you with a summary of my findings on completion of this research if you so wish.

Yours faithfully

Kevin Johnston

I hereby confirm that Kevin Johnston is a registered M.Comm student at UCT.

Professor Derek Smith
Research Co-ordinator

FAX to BOE

Fax number : **021-23 2946**

Attention : Kevin Johnston

Page 1 of 6

OR

E-MAIL to "kevinj@cssa.org.za"

If you have any questions or wish to discuss anything, Kevin Johnston's phone numbers are 021-4811224 during office hours, and 024-8523440 at home.

OPINION QUESTIONNAIRE

Questions are in **bold,** and *instructions* are in *italics*

Please note that this in an opinion questionnaire, it is your opinion which is important.

Wherever possible, please give reasons for your answers; additional comments are welcome.

1. **Should the South African Government develop a National IT Policy at this point in time?**
   Yes / No
   Reason(s).....

2. **Is IT an industry in which South Africa can achieve international competitive advantage?**
   Yes / No
   Reason(s).....

3. **To have a successful IT Policy, Government must balance its IT and other policy options?**
   Agree / Disagree
   Reason(s).....

4. **Is IT an industry which could create international competitive advantage in other economic sectors in South Africa?**
   Yes / No
   Reason(s).....

5. **Should Government provide opportunity for consultation when drawing up an IT Policy?**
   Yes / No

6. **If your answer to previous question was 'yes', with whom? If your answer was no, why not?**
   Reason(s).....

7. **Should South Africa promote IT co-operation with neighbouring states in Africa?**
   Yes / No
   Reason(s).....

8. **Is IT productivity in South Africa better than the overall productivity in the country?**
   Yes / No
   Reason(s).....

9. **How should South Africa increase its IT competitiveness?**
   (Mark or insert as many as appropriate)
   Deregulation of Industry
   Free Trade Agreements
   Tax Reductions
   .....
   .....

10. **Should IT be taught in high schools?**
    Yes / No
    Reason(s).....

11. **What percentage of GDP should Government spend on R&D?**
(Circle a range)

0 to 0,49%
0.5% to 0,99%
1% to 2%
Greater than 2%.

Reason(s).....

12. **Should Companies be given tax relief for IT R&D expenditure?**

Yes / No
Reason(s).....

13. **Should legislation be passed to ensure overseas companies spend a certain proportion of local turnover on co-operative R&D projects?**

Yes / No
Reason(s).....

14. **Should Government generate a demand for IT?**

Yes / No
Reason(s).....

15. **How could the Government generate a demand for IT?**
(Mark or insert as many as appropriate)

Push IT in Public Sector
Popularise IT culture
Tax Reductions
.....

16. **Should the Government allow companies to compete with Telkom?**

Yes / No
Reason(s).....

17. **Should legislation be passed to ensure that imported IT includes a commitment to educate and train local labour to use, maintain and extend the technology?**

Yes / No
Reason(s).....

18. **How could IT improve the distribution of economic and social benefits in SA?**
(Mark or insert as many as appropriate)

Job enrichment
National Health Information System
Accurate Statistics on SA
National Welfare System
Access to Information
.....

19. **How could IT transform the quality of government client service to the people?**
(Mark or insert as many as appropriate)

Faster turnaround
Accurate on-line information
Access to Information
.....
.....

20. Should Government start a 'Buy South African' campaign in terms of IT?

Yes / No

Reason(s).....

21. Should Government promote a local IT industry?

(Mark as many as appropriate)

Hardware
Software
Services

Reason(s).....

22. Should Government provide incentives for Multinational IT companies to do business in SA?

Yes / No

Reason(s).....

23. Which Government department(s) should be in charge of a National IT Policy?

(Enter name of Department(s)) .....

24. Should SA have a National Health IT system?

Yes / No

Reason(s).....

25. Provinces /Government departments creating their own IT Policies could result in:

(Mark or insert as many as appropriate)

Competitiveness
Duplication
Incompatibility
Innovation
Redundancy
.....

26. Each Province / Government department should be free to develop its own IT Policy, co-ordinated by a National IT Agency.

Yes / No

Reason(s).....

27. Should the Government take initiatives to enhance the competitiveness of Small Businesses?

Yes / No

Reason(s).....

28. What sort of initiatives could Government take to enhance the competitiveness of Small Businesses?

(Mark or insert as many as appropriate)

Technological development
Knowledge Acquisition
Training
.....
.....

29. **What items should be covered by a National IT Policy?**
(Mark or insert as many as appropriate)

National IT Committee
Government Ministry responsible for IT
Technological development
Knowledge Acquisition
Education and Training
Research and Development
Technology Transfer
International co-operation
Protection of Intellectual property
IT Industry development
Data Communications
Standards
Government Application Projects
Policies for promoting IT
Small Business
Multi-National Corporations
Regular Review of IT Policy
IT in Public Sector
Reform of Health services
Universal telecommunications access
Taxes, tariffs, customs duty, surcharge etc.
IT in Schools
Statistics
.....

30. **Are Benefits of developing a National IT Policy desirable?**
Yes / No
Reason(s).....

31. **Is a National IT Policy the correct way of achieving these benefits?**
Yes / No
Reason(s).....

32. **IT is a source of political, economic, social and cultural power that tends to prop up already powerful groups in society**.
Yes / No
Reason(s).....

33. **Please add any comments and/or issues**
.....
.....
.....
.....
.....
.....

34. **Do you wish to receive a summary of the findings of this research?**
Yes / No

35. **Has your Department developed its own IT Policy, or does it intend to do so within the next two to three years?**

Yes / No

Reason(s).....

36. **Would / did your Department consider other Departments when developing its own IT Policy?**

Yes / No

Reason(s).....

37. **If your answer to the previous question was 'yes', which other departments were considered or consulted, and why?**

(Enter name of Department(s)) .....

.....

Your Name .....

Your Telephone Number .....

Your Title .....

Thank you for completing this Questionnaire

NO NAMES WILL BE PUBLISHED OR DIVULGED